Spatial Approaches to the Political and Commercial Landscape of the Old Assyrian Colony Period

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Declaration

I, Alessio Palmisano, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

"It is better to be roughly right than precisely wrong" (John Maynard Keynes)

"There are two possible outcomes: if the result confirms the hypothesis, then you've made a measurement. If the result is contrary to the hypothesis, then you've made a discovery" (Enrico Fermi)

Abstract

From the mid-20th century onwards, consolidated study of the merchant archives from the Old Assyrian trading colony at Kaneš (Kültepe) has not only transformed our understanding of the social, economic and political dynamics of the Bronze Age Near East, but also overturned many preconceived notions of what constitutes pre-modern trade. Despite this disciplinary impact and archaeological investigations at Kültepe and elsewhere, our understanding of this phenomenon has remained largely text-based and therefore of limited analytical scope, both spatially and contextually. The time is now right to reconsider it from a wider series of perspectives and this research project aims to do so via a combination of archaeological and computational approaches. The early Middle Bronze Age (Old-Assyrian colony period, ca. 1970-1700 BC) across central Anatolia and upper Mesopotamia was characterised by a network of long-distance overland exchanges. My research aims in this project are to re-assess the Old-Assyrian trade network in Upper Mesopotamia and Central Anatolia during the early Middle Bronze Age by reconsidering the archaeology of the region both on its own terms and via a range of computational approaches (including GIS and spatial statistics). My aim is to offer a sharper view of the fragmented political and economic situation in Upper Mesopotamia and Central Anatolia in the early Middle Bronze Age and evaluate how various environmental and economic factors could have affected the locations and the political and strategic importance of local city-states. Another important objective is to provide a model of the spatial distribution and the hierarchical organization of Assyrian commercial colonies in Anatolia and to reconstruct the ancient trade network in the relevant area.

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Chapter 1

Introduction

1.1 Introduction

This research project focuses on central Anatolia and Upper Mesopotamia during the Old Assyrian Colony Period (ca. 1970-1700 BC). It re-assesses Old Assyrian political and commercial landscapes via both the archaeological evidence itself and a further range of computational and spatial approaches. This period was characterised by a rapid increase in the social complexity of local groups and the further development of long-distance trade contacts, as witnessed by the spread of a wide range of objects and raw materials (e.g. stone, wood, and metals). In Anatolia and Mesopotamia in the early second millennium several different commercial systems co-existed with one another, but in fluid circuits cross-cut by the movement of merchants and envoys belonging to other trade networks and political entities (see Larsen 1987, 53; Barjamovic 2011a, 8-9). The political and economic landscapes of this period are thus patchy, and animated by different rival interests playing out at both local and inter-regional scales. This period also sees central Anatolia and Upper Mesopotamia tied more closely into the wider political world of Near Eastern Middle Bronze Age complex societies.

Despite the large number of archaeological surveys and excavations carried out across Upper Mesopotamia and central Anatolia, the wealth of archaeological finds, and the numerous parallels in material culture to be found between those two regions, a proper cross-cultural and regional study has rarely if ever been attempted in any detail. Furthermore, philological studies of early second millennium texts of Assyrian language from Kültepe, Alişar Höyük and Bogazköy, and the rigorous work of Larsen (1976) and Veenhof (1972) since the 1970s have exerted a decisive influence on Middle Bronze Age research in Anatolia. As consequence, our understanding of this phenomenon has been largely text-based and, therefore, of limited analytical scope, both spatially and contextually. The general lack of analytic and synthetic studies of archaeological data aiming to detect interregional patterns across Anatolia and Mesopotamia could find several explanations. Until recently, one reason has been the limited interest of most Near Eastern archaeologists in creating broad explanatory models of archaeological processes. In fact, the work carried out by most scholars in this region has mainly focused on description, classification and comparison of finds, with particular attention to stylistic details, but typically short of clear analytical methods and/or new theoretical frameworks.

The situation has rapidly changed in the last ten years, and some attempts have been made to record and arrange relevant archaeological data into more appropriate theoretical frameworks. Particular categories of material culture such as Syrian bottles, Khabur ware, balance pan weights and seals have received growing attention with the suspicion that they might be useful tracers of the dynamics of long-distance contact (see Oguchi 1997a, 1997b, and 1998; Emre 1999; Otto 2000; Ascalone and Peyronel 2006b). This study seeks to go further and will combine this evidence via a joint material, computational and spatial approach in order to highlight some past misconceptions about the Old Assyrian trade network and explore its wider economic and political geography.

1.2 Chronological and geographical setting

This dissertation frames the Old Assyrian trade network within a well-defined chronological and geographical setting. In particular, the Old Assyrian period is a chronological label used to define the earliest phase of textual evidence (and to a lesser extent material culture) associated with ancient Aššur and Assyria during the first centuries of the second millennium BC (Veenhof and Eidem 2008, 19). A more detailed discussion of chronology will follow in a subsequent chapter, but if we follow the so-called 'Middle Chronology', this is a period stretching from Erišum I's first year of reign in ca. 1972 BC (Barjamovic *et al.* 2012, 26-28) and continuing down to ca. 1700 BC. Nevertheless, Kültepe's lower town levels III and IV, although not much known or excavated, show that at the end of the third millennium perhaps a commercial quarter already existed (Emre 1989; Kulakoğlu 2011a, 1020; Aubet 2013, 309).

This dissertation will place the inter-regional trade systems set up by the Assyrians within their wider political context in central Anatolia and Upper Mesopotamia during the Old Assyrian colony period. Such a perspective offers a better understanding of the social and political dynamics affecting the long-distance contacts between the early-complex societies present in my study area. In the early second millennium BC, the plains of northern Mesopotamia and the intermountain valleys of central Anatolia saw the emergence of a political landscape shifting from a peer-polity system of smaller city-states in its early stage (ca. 2000 – 1800 BC) to a few larger territorial states in its later stage (ca. 1800 – 1600 BC, e.g. Šamši-Adad I's kingdom in Upper Mesopotamia and Anitta's kingdom in central Anatolia). In the present thesis, I will refer to central Anatolia as the area confined between the Pontic Mountains to the north and the Taurus mountains to the south, while Upper Mesopotamia is the land between the Tigris and Euphrates Rivers above where these rivers enter the southern Iraqi alluvial basin. Today those two regions fall in parts of three nations: northern Syria, northern Iraq, and central/south-eastern Turkey.

1.3 Research Questions

Via a combination of archaeological, textual and computational approaches, this work will be able to offer a more complete and clear understanding of the Old Assyrian trade network in Upper Mesopotamia and Central Anatolia in the early 2^{nd} millennium BC. The chapters that follow will therefore deploy a broad range of tools and evidence to discern the scale, modality and diachronic development of the political and economic systems in the northern Mesopotamian and east-central Anatolian region and, more precisely, to answer the following research questions:

- What political, economic and/or social factors favoured the spread of specific examples of material culture during this period, such as Khabur ware, so-called Syrian bottles, pan balance weights and seals?

- To what extent and by what textual and non-textual means can we clarify the political geography of central Anatolia and Upper Mesopotamia in the Middle

Bronze Age particularly with regard to the hierarchical organisation of city-states?

- What were the likely trade routes used by the donkey caravans starting from Aššur and heading towards the commercial settlements in Upper Mesopotamia and Anatolia? How well can we trace them archaeologically and what do they tell us about trading logistics and/or the political situation at the time?

1.4 Aims and Objectives

The first of the above research questions will be approached through the study and analysis of four specific examples of material culture that have often been invoked as tracers of long-distance exchange and/or political structures in the region: Syrian bottles, Khabur ware pottery, balance pan weights and seals with a view to understand the possible political and economic dynamics that caused their spread in Upper Mesopotamia and Central Anatolia. In particular, by using published and unpublished data and adopting a quantitative, spatial approach, I will assess (a) the diachronic distribution of those types of material culture in Upper Mesopotamia and central Anatolia during the early 2nd millennium, (b) the relationship between specific typologies and different archaeological contexts and (c) how the spatial distribution of those objects is related to the Old Assyrian and other trade systems.

A second approach will focus on the spatial analysis of settlements distributed across two well-defined study areas: central Anatolia and the Khabur Triangle. This focus will be based on a range of spatial statistics techniques that formalise the description of the settlement size distribution and offer a quantitative measure for distinguishing more nucleated versus more dispersed settlement patterns. Then, I propose to apply a novel method to understand past settlement hierarchies and to predict which sites and areas would have become prominent in the Old Assyrian Period by using known archaeological sites as point data and historical information for calibration purposes.

A third and final approach will thereafter reconsider ancient routes from the Assyrian capital, Aššur, to the Anatolian city-states by analysing Old Assyrian texts and modelling possible paths or corridors of movement in order to detect which factors (e.g. environmental and/or socio-political) affected these long-distance interactions, and to explore their relationship to wider political geography. Below I outline some of the technical methods by which I will provide computational models of such long distance interaction, but in addition, the material and textual evidence can be integrated in order to trace the network of private businesses of Assyrian merchants involved in the trade.

1.5 Choice of Data and Methodology

My research aims are to re-assess the Old-Assyrian trade network in Anatolia and Upper Mesopotamia during the early Middle Bronze Age by reconsidering the archaeology of the region and by using a variety of computational and spatial approaches (including GIS, remote sensing and spatial statistics). I will carefully blend material, textual and computational approaches to consider three specific sub-topics implied by the above research questions.

The use of written sources represents a particularly privileged tool for several reasons: the texts provide direct albeit not unproblematic information about political geography, the logistics of trade such as the distribution of way-stations *en route* and the presence of physical infrastructure for crossing the Anatolian rivers such as bridges, ferries and fords (Barjamovic 2011a, 19-37). The written sources come mainly from Kültepe's lower town, where level II has yielded ca. 23,000 clay tablets and level Ib some 500 clay tablets.[1] Smaller groups of texts have also been discovered at other sites located in Central Anatolia such as Boğazköy (72 texts), Acemhöyük, Kaman Kale-Höyük (1 tablet) and Alişar Höyük (63 tablets). Other written sources, contemporary with the archaeological layer IB of Kültepe, have further been found at the sites of Mari and Tell Leilan (500 texts).

[1] The two levels of Kültepe are dated according to the following chronology:

- Level II (ca. 1970 – 1835 BC);
- Level Ib (ca. 1835 – 17th c. BC).

The archaeological data come from sites that have been investigated over the past few decades by archaeological excavations and extensive surveys. For the purpose of this project, two different well-defined sub-regions within my research area have been chosen: the Khabur Triangle and central Anatolia. The choice of the two areas has been influenced by the limited number of regions where a sufficiently high intensity of archaeological excavations and surveys has been conducted, and by the need to provide a coherent framework for analysing settlement systems, given the various gaps in the survey record across Upper Mesopotamia and central Anatolia in the Middle Bronze Age (ca. 2000-1600 BC). The two areas, however, should not be viewed as fully isolated from each other as testified by the long-distance commercial system set up by the Assyrians in the early second millennium, if not before. Via the study and the analysis of published archaeological surveys reports, I have also created a spatial database composed of 439 sites in the Khabur Triangle and 440 sites in central Anatolia during the Middle Bronze Age.[2]

A database of all published and some unpublished items has also been created for the Syrian bottles (n =103), Khabur Ware (n = 2574), balance pan weights (n = 376), and seals (n = 2515). The published data for these object classes comes from all archaeological sites excavated in Upper Mesopotamia and central Anatolia with a known occupation during the Old Assyrian colony Period, while the only unpublished data used here relate to Khabur Ware stored in the British Museum and in the UCL Institute of Archaeology's collection (see Palmisano 2012). Wherever possible, each item of all four types of material culture (Khabur Ware, Syrian Bottles, balance pan weights and seals) has been recorded with respect to local stratigraphy, context (domestic/public buildings, palaces, temples, cultural areas, graves, etc.) and attributes (e.g. shapes, decoration motifs, styles, sizes, weight, etc.).

1.6 Thesis Outline

Chapter 2 will offer background on the political and economic structure of early complex societies in Western Asia and will introduce the landscape perspective on

[2] For a complete list of published archaeological surveys carried out in Syria and Turkey see Wilkinson (2000, 223-224), and Glatz (2006, 539-541).

social, economic and political trajectories that is used thereafter. It will discuss a variety of theoretical frameworks about how archaeology, integrated with the study of written sources, can contribute to our understanding of the multifaceted landscapes and complex polities. Chapter 3 will then provide further necessary background information about my study area, and will also briefly discuss the chronology adopted in this thesis. My three main research questions are then addressed in three successive chapters dealing with the following themes: settlement size hierarchy, connectivity and material culture. In Chapter 4, I will revisit several classes of material culture that already have been proposed as markers of political structure and long-distance exchange in the region: Syrian Bottles, Khabur Ware pottery, balance pan weights, and seals. These will be assessed quantitatively where possible in order to detect specific spatial and functional patterns on local and regional scale and to tackle possible misunderstandings derived from applying traditional interpretative approaches to these classes of materials. Chapter 5 introduces methods for describing particular settlements patterns and addressing the extent to which geography, transportation, external contacts, and socio-economic factors make locations attractive for trade and settlement and why some archaeological sites become major urban centers in the Old Assyrian period in Upper Mesopotamia and Central Anatolia, while others do not. Chapter 6 offers an overview of the methodology used for reconstructing long-distance patterns of social, political and economic connectivity, as well as specific routes, via written sources, archaeological data and computational modeling.

Chapter 7 will discuss the results of the spatial analysis presented in Chapter 5, this time in relation to the Assyrian merchant trade routes in Chapter 6 and within the long-distance scenarios proposed from the results of the analysis of the material culture (Chapter 4). It will thereby look to answer in a more comprehensive way all the three research questions, offering at the same time grounds for a discussion of the wider implications of this thesis. Finally, chapter 8 will summarise the main outputs of the work, highlight some of its limitations and consider a range of possible future perspectives. Figures and tables are provided in a separate volume.

Chapter 2

Theoretical Approaches to Landscape, Political Geography and Trade

2.1 Introduction

This chapter addresses those methods and theories that might assist an archaeological study of early complex societies and pre-industrial economies in Western Asia. It explores several theoretical topics that provide us with a framework for thinking about the formation and development of hierarchically organized polities such as cities, city-states and larger territorial states, as well as their economic systems, all placed within a landscape perspective. We can begin below with a series of existing books and review articles that already summarise the state of research on certain theoretical topics within archaeology, but which perhaps have been based in some cases on overly simplistic conceptual frameworks. A key point I would like to make is that even though the long-lasting debate between modernists/formalists (who emphasize similarities between early economies and modern capitalist economies, e.g. Silver 1995; Temin 2001), and primitivists/substantivists (who see radical differences between pre-industrial economies and their modern counterpart, e.g. Polanyi *et al.* 1957; Sahlins 1972; Finley 1999), has been declared over (Halperin 1984; Isaac 1993), its unfortunate legacy has prompted a tendency among archaeologists to oversimplify the issue of early complex societies' economies through the view of a market versus no-market dichotomy (cf. Wilk 1998, 469; Feinman and Garraty 2010). I think that taking part in this debate is unfruitful, risky and circular. Instead, political and economic landscapes deserve to be disencumbered from this debate above and, instead, might benefit from a return to the empirical data without making exclusive use of just one *a priori* interpretative framework.

The chapter below starts by introducing the concept of 'archaeological landscape' and considers how early complex societies and pre-industrial economies might be framed via a spatial dimension that successively reveals their local, regional or international nature. The discussion that thereafter follows will be necessarily selective, focusing on how political landscapes (e.g. villages, cities, city-states, territorial states, empires) reveal substantial variation of their associated economic systems (e.g. temple and palace, households, regional and inter-regional sytems).

Drawing inspiration from the key points outlined above, I will develop a variety of theoretical themes about how archaeology, integrated with the study of written sources, can contribute to our understanding of the multifaceted landscapes of complex polities and provide informative insights for the study of the political and economic aspects of early complex societies.

2.2 Defining an archaeological landscape

The landscape concept plays a pivotal role in both archaeology and geography, where this is often a perceived opposition between natural or physical landscapes on the one hand, and cultural landscapes on the other (Cosgrove and Daniels 1988). The latter have been defined by the World Heritage Committee as including "cultural properties ... representing the combined works of nature and of man" (UNESCO 2012) ranging from those landscapes most deliberately shaped by people to those least shaped by the human hand and mind (UNESCO 2005). A conceptual basis for interpreting such landscapes has been provided by the work of the American geographer Carl Sauer (1925), while a further major boost for the development of landscape archaeology, as discipline which studies the ways in which people in the past shaped and used the environment around them, lay in the pioneering aerial photography and surface surveys carried out over the English countryside in the 1920s (e.g. Fox 1923). Thus, the term landscape refers not only implicitly to its physical manifestation, but also to a system of human-made spaces and places on the land (see discussions in Hirsch 1995; Lemaire 1997; Stoddart 2000).

Building on these insights, from the mid-twentieth century, there was a renewed emphasis on how human interaction with the environment could drive social evolution and determine the spatial distribution of social life. Those studies embraced a spatial approach aiming to investigate how the rise and development of complex societies could be due to particular subsistence strategies and/or social organisations adopted within a given environment (see Sanders 1956; Adams 1960, 1965, 1966, 1981). As result, culture arising in different ecological and topographical settings, such as forests, deserts, steppes, plains, or hills, was anticipated to develop different social evolutionary trajectories (Steward 1972, 37).

Amidst the growth of processual archaeology, the mid-twentieth century was marked by a more quantitative approach in geography that prioritized a set of spatial analytical techniques in order to infer how environmental variables and direct interaction between human communities (e.g. settlements) might determine different observed spatial patterns. Spatial analyses were originally introduced by geographers in the 1950s and 1960s, and then adopted and modified by archaeologists in the 1970s (Hodder and Orton 1976). In the past two decades, there has been a renewed interest in quantitative and computational approaches applied to archaeology (Williams 1993; Gaffney *et al.* 1997; Ladefoged and Pearson 2000; Premo 2004; Conolly and Lake 2006; Bevan 2012; Crema 2013). Furthermore, a wide range of archaeological landscape surveys have also promoted the idea of a near-continuous archaeological landscape, where archaeological evidence may be discerned not only inside and around sites but potentially everywhere throughout the countryside (see discussion in Cherry 1983).

Complex societies, especially those characterized as ‘states’, provide significant venues for applying landscape-based perspectives. For example, territorial control and boundary marking, as practices common to the past and present activities of all human groups, should be investigated to reconstruct past landscapes. Sedentary communities in particular exploit and use the land around the place in which they settle for a variety of different purposes: subsistence, defence, collection of raw materials, etc. Consequently cultural, topographical, ethnic, political and economic boundaries have all become objects of archaeological research and the history of recent studies is littered with attempts to detect and locate these problematic barriers (Thünen 1966; Finzi and Higgs 1992; Flannery 1972; Renfrew and Level 1979; De Atley and Findlow

1984; Stančič *et al.* 1994; Bell and Lock 2000; Silva and Pizziolo 2001; Cunliffe 2003; Hare 2004; Ducke and Kroefges 2008; Bevan 2010 and 2011). Analyses of archaeological settlement often rely on important theoretical models applied in geography by earlier researchers (Thünen 1826; Weber 1909, Christaller 1933) and the most common type of spatial analytical technique used by archaeologists for defining territories has been the Voronoi tessellation where the space between observed settlements is allocated to the 'control' of the nearest settlement (also known as a set of 'Thiessen polygons'). However, the use of the latter model for building wider inferences from settlement patterns among state-level societies is questionable (see Wilkinson and Tucker 1995, fig. 41) not least because standard methods do not usually consider the size and the hierarchical rank of the settlements involved. This is merely one example in which the tools and the methods of processual archaeology for understanding past landscapes have been criticized for their assumption of an objective space devoid of social effects. Smith defines this approach as spatial absolutism (2003, 45-54), which results in the displacement of our analysis, away from real places onto idealized geometric planes, where the particularities of geography and environment are discarded, leaving only geometrical features on an undifferentiated background.

On the other hand, the work of Barbara Bender (1993) on landscape has drawn archaeological attention to the interpretation of the landscape via human perception (Tilley 1994). In this manner, a growing number of archaeological studies have moved from considering a landscape as a passive natural background to a sense of it as something subjective, something experienced, and something that changes through time and space and is moulded by human action (Thomas 1995; Edmonds 1999; Knapp and Ashmore 1999, 1-30). As a consequence of these fast-paced developments in the past few decades, Stoddart and Zubrow have stated that "the current diversity of landscape approach is now too great to be encompassed in one definition" (1999, 688), so that archaeological landscapes may be analysed via a wide range of perspectives and analytical methods. Any real definition of an archaeological landscape must now range from consideration of the manipulation and control of landscape as an "instrument for establishing physical, expressive, and imagined political relationships" (Smith 2003, 272) to economic infrastructure and built features (e.g. roads, canals, agricultural terraces, etc.) occurring over the earth's surface (Wilkinson 2003, 4) and to a broader awareness of the land as physical form and product of social and political-economic ideologies.

2.3 Cities, States and City-States

2.3.1 Definition and Origin

Partly, as an introduction to the concept of a political landscape, it is worth revisiting some important aspects of the political terminology often used to describe early complex societies. Many studies have paid significant attention to the origin and the development of the archaic state, and the prevailing working definitions imply the "state" as an independent or near-independent political unit characterised by four primary features: 1) radical social stratification (Fried 1967, 186); 2) centralized government administration (Offe and Ronge 1997, 60; Hinsley 1986, 22-26); 3) legal, military and economic authority over a designated group of people (Wright 1978; Smith 2003, 149-83); 4) the consistent threat of legitimate force as compelling instrument to adhere to the existing political order (Jessop 1990, 342; Sanderson 1995, 56).

The state formation process has often been framed via an evolutionary sequence from small and simple to larger and more complex forms of social organization. Different labels have been used to define different examples of social organization where bands, tribes and chiefdoms, and states were respectively egalitarian, ranked and stratified societies (Fried 1967, 186; Hinsley 1986, 22-26; Smith 2003, 149-83). Nevertheless, it seems naive to adopt such simple definitions for tracking any possible linear development from simpler groups to more complex ones because the underlying assumption of a monolinear and/or unidirectional social evolution is problematic (Johnson and Earle 2000, 5-7). For example, observing that earliest states do not appear to have developed out of tribes and that this kind of social organization could have not played a crucial role in this process, Crone has stated that the tribal organization could be considered as an alternative rather than a precursor to the rise of the state (1986, 58-68). Hence, when states became dominant, tribes either were (a) wholly absorbed, (b) continued to represent an additional vector for power within them (e.g. Mari; see Fleming 2004, 26-103) or (c) perceived the state as a competitive political entity (see Kradin 2002).

On the other hand, chiefdoms as early forms of hierarchically organized polities based on kinship are more closely related to the emergence of the state and could conceivably be seen as its precursor for their governmental centralisation (Sanderson 1999, 55). Even so, Yoffee argues for a multilinear perspective, where chiefdoms might not necessarily represent a predecessor of all state societies (1993). The most common and striking demarcation between state and chiefdom is that the latter lacks as clear a legal and state apparatus for forceful repression of social fissioning (Claessen and Skalník 1978, 22; Pauketat 2007, 16-26). In this view, fission is less likely due amongst other things to more complex sedentary settlement systems (see discussions in Olsson and Hibbs 2005; Putterman 2008). The appearance of states was a consequence of socioeconomic development (rises in population, production, technology, etc.) stimulated by advantageous or even harsh ecological and social circumstances. Sedentary farming, the emblematic result of a steady settled lifestyle, may have served as precondition for the rise of early states: a centralized political organization wielding its political, economic and military authority over a territory and a defined group of people, and guaranteeing the division of labour, the storage of food surplus and the extraction of sources. Thus, it is not by coincidence that early states appeared in those parts of the world that first adopted agriculture, in spite of their different environmental conditions: the Fertile Crescent, in the Indus Valley, in the Central plain of China and later in Central Mesoamerica (Scheidel 2013, 9-10).

Moreover, once the possible preconditions of state formation have been identified, it is more difficult to establish the specific mechanism that could have driven the process. These mechanisms have been the main issue of an animated debate between ‘managerial’ and ‘conflict’ theories (see discussions in Claessen and Skalník 1978, 5-17;

Wright 1978, 504; Sanderson 1999, 68-86).[3] Nevertheless, reviewing a host of different factors such as population pressure, trade, warfare, conquest, defence none of them is sufficient for explaining the state formation process (Cohen 1978). Any oversimplification should be avoided and it appears that archaeologists and anthropologists, whose main strong focus is the material culture, may tend towards managerial and functionalist perspectives that arise naturally from the study and analysis of material record. On the other hand, historians and social scientists, may well privilege conflict and inequalities as aspects clearly dominant in textual evidence. Thus, it is worth going beyond this theoretical dichotomy and integrating both approaches and kinds of data (archaeological and textual) in order to understand more deeply the different faces of interdependent social processes (Johnson and Earle 2000, 305; Scheidel 2013, 12).

Fried has pointed out how it is pointless trying to define "the state" if all of us, as social scientists, do not also agree on common set of analytical tools (1967); while Smith has pointed out that the "state, despite its centrality, is an entirely nebulous object of study" (2003, 95) and its conceptual fuzziness is extraordinarily problematic. I conclude in this section by asserting that whereas states may be the result of a process starting from different level of social organization and, then developed into conditions that fulfil the principal criteria of state-ness defined above, this process cannot be seen as finite. "States are never 'formed' once and for all. It is more fruitful to see state formation as an ongoing process of structural change" (Steinmetz 1999, 9) rather than as temporal snapshot. States are constantly made and remade by their context, but they are also political units shaping both the physical and socio-economic landscapes under their authority. Thus, I will employ the term "state formation" for indicating the overall spatial and temporal development of states.

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[3] In managerial theories members of state benefit the distribution and the provision of public goods, and the management of the division of the labour. Some models emphasize the trade and economic change, with groups having different access to specific traded goods, increasing both the economic and political complexity. According to this approach state formation is seen as an ongoing process belonging to a large system of social-economic interactions among the political agents (Service 1975; Wright 1978).
In conflict theories the state causes and perpetuates social inequality. In this view, this endogenous stratification needs a state apparatus to control the population. Nevertheless, the two main problems with this approach is that the ruling class is embodied with the economically dominant class and that the harsh stratification is a product of state creation (for discussion on Marxist theory see Claessen and Skalník 1978, 6-9; Wright 1978, 504; Sanderson 1999, 72-74).

2.3.2 Categories of political units

Beyond the basic features introduced in the opening section, archaeologists, sociologists, anthropologists and historians have attempted to classify states according to a wide range of different criteria. Some scholars have focused on the administrative and bureaucratic apparatus, framing the state within either a simpler or more elaborated structure (Weber 1978, 1028-1031), or they have offered a more complex taxonomy based on the development of social and hierarchical ties among different political agents (Claessen and Skalník 1978, 22-23; Crumley 1995). Other scholars have preferred to emphasise a close relationship between early urbanism and complex forms of social organization, and how the economic and political centralization of the state manifests itself in the form of nucleated settlements (see discussions in Fox 1977). Fox pointed out that the administrative and centralized structure of the state is an extension of the bureaucratic city, due to its capability to extract sources and labour from the surrounding rural hinterland (1977, 34-37). On the other hand, Trigger separates the discussion between urban and state formation by asserting that states can exist without cities, but not vice-versa (1972, 576). Trigger is even more categorical by recognizing only two kinds of states: city-states and territorial states. The first one indicates an urban centre and its hinterland, while the latter one was a larger entity with multiple administrative centres ruled by residents linked to the state (Trigger 2003, 266-267). Nevertheless, Hansen (2000, 16) objects to this dichotomy and says that a city-state is merely a territorial state with a small territory and well-defined borders. In addition, he suggests that it is more appropriate to replace the misleading term "territorial state" with "macro-state" to denote those "states in possession of a large territory dotted with urban centres, of which one is capital" (2000, 16). Hence, the city-state is one of the most common forms of micro-state. Slightly different is the position of Marcus (1998, 92), who argues that territorial and city-states "were often different stages in the dynamic cycles of the same states, rather than two contrasting socio-political types," and that the clusters of city-states in a specific area was the result of the political collapse of earlier unitary states.

Along slightly different lines, Eisenstadt (1993, 10) distinguishes five basic categories of pre-modern state: patrimonial empires, nomad or conquest empires, city-states, feudal states and historical bureaucratic empires. For him the structural and morphological difference among these categories lies in the different levels of centralisation. By contrast, Finer (1997, 6-13) proposes four different types of state: city-states, "generic" states (roughly equivalent to territorial states), national states, and empires. He classifies the states according to the degree of centralization and standardization of administration, and cultural homogeneity. Some political entities such as nomad states and nation-states fall outside the geographical and chronological frame of the present dissertation, and we will deal primarily with city-states and larger territorial states occurred in Upper Mesopotamia and Central Anatolia in the early 2nd millennium BC. Whereas I agree with the idea of Marcus (1998, 92) that territorial and city-states should be not considered two contrasting socio-political systems, and I accept the definitions of micro and macro-states provided by Hansen (2000, 16), in the present doctoral thesis I will continue using the conventional terms "city-states" and "territorial states" in order to avoid introducing new jargon that could add to the semantic confusion.

In general, the city-state is defined as a small political independent system, characterized by a capital city or town, economically and politically integrated with its immediately surrounding rural hinterland (Charlton and Nichols 1997, 1). City-states have often, but not always, occurred in clusters of fairly evenly spaced units of comparable size (Renfrew 1975, 12-20). Our understanding of city-states as socio-political unit has been significantly enhanced by the massive comparative study of thirty-six city-state cultures promoted by Hansen (cf. Hansen 2000 and 2002). Hansen deliberately draws an idealised picture, (2000, 17-19) in which a city state is a highly institutionalized and centralized political unit characterized by one capital city or town that is well-integrated socially with its surrounding hinterland and inhabited by a stratified population in which there are citizens, foreigners and slaves. The capital city is the economic, religious, political and military centre of the city state. Within the city-state territory there could have been other nucleated settlements apart the major urban centre, but in such cases, they are second-order settlements (Fig.1). The territory is also sufficiently small that its boundary can be reached in a day's walk out or less,[4] and hence the number of people acting as privileged political actors is also small.[5] By contrast with the modern notion of a state, I agree with Hansen (2000, 15) when he argues that the population of a city-state may share an ethnic identity with the population of neighbouring city-states, as its sense of political identity is primarily embodied via the city itself and differentiated from other city-states. On the other hand, some scholars have conceived the city-state as ethnically distinct from other neighbouring city-states (cf. Burke 1986; Marcus 1989, 201; Trigger 1993, 8-14; Charlton and Nichols 1997, 1).

In terms of political economies the urban centre implies specialization of functions and division of labour, so that the population can satisfy its subsistence and daily needs. Numerous pieces of archaeological evidence suggest that urban centres did not have enough land to sustain their population, and thus they relied upon food surplus produced by rural communities dispersed around the cities (Wattenmaker 2009, 116).

The city-state is not necessarily independent and can be tributary polity or domain of another city-state, or of a territorial state (Hansen 2000). Most likely boundaries between city-states were continuously contested and centres competed with one other in order to guarantee the control of natural resources, with particular geographical features having a military strategic role (e.g. mountain passes, commanding views over landscape from the top of hills, fords, etc.), and grazing lands. Both settlement patterns and texts reveal that the city-states were often part of a "peer-polity system", a world of politically independent but economically and socially interdependent and roughly equivalent polities (Renfrew 1986, 1; Wattenmaker 2009, 123). Peer polity relations perhaps played an important role in the development of early political entities with inter-urban relations that on the one hand were cooperative and apparently motivated by maintaining good relations and avoiding conflict, but on the other hand were competitive and aiming to achieve political and logistical advantage (Wattenmaker 2009, 118).

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[4] The ideal maximum extent of the surrounding hinterland has been defined by Hansen of around 30 km (2000, 17).

[5] A city state has usually a population of several thousands of inhabitants (Hansen 2000, 601). Nevertheless, very small city-states can also have a population lower than one thousand inhabitants (Di Cosmo 2000, 397), while over-sized city-states may reach 100,000 number of inhabitants (Hansen 2000, 18).

The success of the larger territorial states depended on the ability of the new rulers to coerce and co-opt the urban elites of the former city-states within the structural and political texture of their regional kingdoms (Roth 1997, 76-81; Garfinkle 2013, 116). Those elites, in fact, were at the centre of the ideological and redistributive networks of the cities, as administrative, religious and military officers. The study of the available archaeological end textual evidence has revealed that the political landscapes of western Asia probably witnessed a series of repeated cycles from small political entities to large territorial states over the course of the period from the fourth to the first millennium BC (Marcus 1998; Thuesen 2000, 64; Ur 2010a). During this period, city-states remained the more stable and longest-lasting political unit, while the larger regional kingdoms were often politically fragile and could last only one a generation or a single dynasty. At this point "one can present a model of Mesopotamian history in terms of a pendulum swinging between periods of political fragmentation and central rule" (Barjamovic 2013, 123). At times, the region was divided into hundreds of city-states and tribal communities, and at other times a large and centralized state imposed its authority upon numerous and weaker existing political entities. The political centre of a larger territorial state may have been a former city-state that rose to supremacy, but in several cases the cause was exogenous and the Mesopotamian empires were often shaped by individuals or groups not native to the communities that they came to dominate (e.g. the Akkadian Empire, Šamši-Adad I's kingdom, Hammurabi's state, the Kassite state, Mitanni).

2.4 Structural characteristics of pre-industrial complex economies

2.4.1 Theoretical frameworks

Pre-industrial complex economies have been studied and analysed in several and different social science disciplines via some quite different approaches. Economists have offered over-arching models to understand pre-classical economies, but they have rarely considered archaeological data in any detail. Historians working upon Western Asia and Classical world have a decent amount of economic data through written sources, but their works have sometimes been too particularistic and focused on just some aspects. Archaeologists have much relevant data but their interest in pre-industrial economies slightly faded in the 1980s, so that the economic aspects of early complex societies have been neglected and only rarely investigated properly. Silver (2004, 82) harshly but rightly points out that all social scientists, in particular archaeologists, anthropologists and historians, dealing with ancient economies should take “an introductory course in economics or simply reading a principles text before issuing authoritative pronouncements about economics”.

From the mid-twentieth century onwards, a long-lasting and animated debate about pre-industrial economies has been polarized on two opposite approaches that respectively see the past as a primitive version of the present or as a different and distant world (Smith 2004, 74-75). On one hand, the “modernists” argued that the pre-industrial societies did not differ so much from the modern economy, whilst on the other hand, the “primitivists” stressed the agrarian and the small scale nature of early complex societies’ economy if compared with modern capitalism (Finley 1999). The same dichotomy of modernists vs primitivists can be retrieved in the debate between formalists and substantivists in economic anthropology. According to the formalists pre-industrial and modern economies differed from each other only in degree, while the substantivists pointed out that the ancient economies were completely different from modern capitalism (cf. Sahlins 1972; Wilk 1996; Smith 2004, 75). The most influential substantivist was probably Karl Polanyi, whose work had an enormous influence in archaeology. He theorised (1957) that pre-industrial economies were based on the exchange mechanisms of reciprocity and redistribution, while the market’s role in antiquity was minimal and not influenced by factors such as supply and demand. In addition, there were not true markets and prices rising or falling in response to the changes in supply and demand, but rather “equivalences” set by the king and modifiable by royal decree.

However, it is probably fair to say that Polanyi’s ideas about market-less early state economies now appear wrong and distorted if compared with the bulk of evidence of commercial activity in, for example, the Bronze Age Middle East as well as the later Classical world. Unlike Polanyi, Silver pointed out the importance of applying the categories of modern economic theory to the study of pre-industrial economies, and the role played by markets as mechanism of exchange in the early societies (2004, 65-66). In fact, available textual data do not suggest that in the Near East the prices were controlled by the political authorities. Changes in supply conditions due to the political disorder and/or to the climatic conditions could impact supply and hence price, by indicating the existence of price-making markets (see a detailed list of examples in Silver 1995, 97-177; Silver 2004, 66-67). By contrast, Slotsky and Wallenfells (2009) continue to state that price fluctuations were not subjected to market forces and the prices of agricultural products would have not been dictated by changes in supply and demand.

So far, I have provided an overview of the most distinctive approaches applied to the study of pre-industrial complex economies. It is worth stressing that each past culture has its own characteristics and any economy should be studied within its social context. So, we should acknowledge that economic theory can provide helpful models and tools of analysis, but we should also be extremely cautious in the use of such models as explanatory framework for the pre-industrial economies in Western Asia. In fact, the available archaeological and textual evidence rarely offers an unequivocal picture of past economic activities. The problems associated with archaeological scale of evidence represent a common and difficult issue both when we deal with the volume of goods produced and traded and when we try to assess the social meaning of foreign object that, for instance, may have been used as exotic status markers (see Sherratt and Sherratt 1991; Bevan 2007, 26). Apart few rare exceptions (e.g. destruction layers, shipwrecks, unplundered burials, etc.), archaeological data are often incomplete and biased by poor preservation status and/or inadequate recovery techniques. In addition, very little of material is recoverable from organic goods (e.g. oil, wine, food, textile, wool, food, etc.), so that the scope of a researcher is based on a limited number of textual and chemical analyses.

Metals were the main goods traded within a system of long-distance and inter-regional commercial links across much of Central Asia, the Middle East, Europe and the Mediterranean in the 2nd millennium BC, but they also represent a problem as they involved a highly and extensively recyclable material (Budd *et al.* 1995; Hall 1995;

Sayre et al. 1995; Muhly 1995; Sherratt and Sherratt 2001). For instance, Kültepe's tablets reveal a very large amount of metal (mainly tin, silver and gold) circulating via single transfers over time throughout Upper Mesopotamia and Central Anatolia, which strongly mismatches with the relatively small amount found in ordinary archaeological deposits. Actually, according to 9,903 published texts from Kültepe, the total recorded quantity of tin exported to Anatolia is about 60,000 kg over a rough period of 30 years (between ca. 1889 and 1959 BC; see Barjamovic 2011a, 11). Lassen (2008, 32) has counted about 32,000 textiles (*kutānu*) exported to Anatolia. Considering that a further 13,000 texts from Kültepe await publication, the total known tin and textiles export could easily increase.[6] Moreover, this does not yet factor in what portion of the original documented trade survives archaeologically as tablets, and it is worth noting again that the study of the textual evidence alone (and coming almost exclusively from Kültepe) provides a rather biased picture of the Old Assyrian trade system itself.

Therefore, neither the archaeological evidence nor the written sources can provide a clear and secure picture of past phenomena , and we must try to integrate those two kinds of data sets if we want to discern the scale and character of pre-industrial complex societies. A combination of factors surely allows us to identify cycles of consolidation and collapse of interregional interaction over time in Mesopotamia due to varying levels of social complexity and local transport technologies (Tainter 1988, 44-90; Marcus 1998, 81; Jennings 2011, 66-69; Beaujard 2011, 8-11). The worlds-system model, despite its weaknesses, if employed flexibly, can explain a pattern of long-distance interaction promoting cultural and economic contacts between the urbanized Mesopotamia and the Levant and Anatolia (see, Larsen 1987; Kohl 2011, 83-85; Rahmstorf 2011; Broodbank 2013, 335-338). Metals were surely the driving forces of these long-distance interactions (e.g. tin, silver and gold in the Old Assyrian trade system), but also other goods such as textiles, wood, wines and oil were clearly important at an interregional level (Bevan 2007, 38; Warburton 2011, 132).

[6] Veenhof (1972, 79-80), analysing a lower number of texts (ca. 2,500), estimated about 13,500 kg of tin and 14,500 textiles were shipped from Aššur to Anatolia.

2.4.2 Property and Land Management

An early model of the economic workings of early complex societies in the ancient Near East was a "temple-city", as theorized by the Sumeriologist Deimel (1931) and by his pupil, the historian Schneider (1920). On this understanding, for instance, all agricultural lands were supposed to have been owned by temples and the whole population was supposed to have worked under their authority. However, this model has been broadly discarded and today it is commonly accepted that exclusively temple-based economies in the ancient Near East are a misleading idea, perhaps with the partial exception of the Third Dynasty of Ur according to Foster (1981). The issue concerning the degree of centralization of Mesopotamian economy and the role played by temples and palaces in its management is still debated. It is important to point out that the association between public institutions (palaces and temples) and financial activities may be biased by archaeological excavations privileging public buildings rather than private houses (Bulgarelli 2011, 40). If we no longer assume that the temple held a monopoly of productive activities, there remains plenty of possible space for private properties, for private management of irrigation networks and for a free market (cf. Hudson and Levine 1996).

At this point, it is useful to distinguish two possible types of land ownership documented in varying measures in the Near East from the end of the fourth to the first millennium BC: private and institutional (Renger 1995; Liverani 2005, 50). The identification of private with individual ownership is a misleading concept because in the Bronze Age in Mesopotamia the land was perhaps owned by kin groups rather than by a single person (Durand 1982; Postgate 1992, 95-96, 184). Of course, in practice, a certain individual or family probably owned or at least held the usufruct of a field within the communal holdings. Such a land may even have been bought and sold. According to Liverani (1984) personal ownership started emerging in the Late Bronze Age, through a process of usucapion. Private ownership allowed households to freely manage their lands, including selling them. This is a kind of ownership well documented by the sale records of agricultural lands, something occurring rarely in the third millennium BC and more frequently later (Diakonoff 1982, 8-13; Van De Mieroop 2004, 54-55; Widell 2008, 207-208).

Institutional ownership is the best attested and documented but its nature is the most problematic to ascertain because we have to assess what was in a given period the economic role and the importance of the palace and of the temple for the people living in the same territory. The misleading equation between palace and state is still common and needs to be carefully revisited. Thus, palace or temple institutions should be regarded as unusually powerful households that existed beside other private or institutional households (van Driel 1994, 181-192; Van De Mieroop 2004, 55). In fact, the basic socio-economic unit of pre-industrial economies was the household and the economic patterns of the Middle East city-states were based on the relationships between big and small households (Garfinkle 2013, 111). The development of the early states depended on the ability of palace and temple agencies to appropriate and manage for communal purposes the food surplus produced predominantly by the agrarian communities (villages or enlarged families; Liverani 2005, 50). The most important flux of resources were not the agricultural products, but the labour that palace/temple agencies obtained compulsorily from the villages by charging most of the social costs to the local communities (e.g. taxes, military confiscation, tributary arrangements, voluntary offerings to temples and festivals, etc.; see Pollock 1999, 79; Liverani 2005, 50-51; Garfinkle 2013, 112). This process naturally caused the appropriation of much of the collective wealth that was enabled in the redistributive mechanism of exchange. Each household and, thus, each segment of the economy had obligations to fulfil to the central state authority (see Fig. 2). Hence, the non-institutional households had to provide labour and payments (as agricultural products and/or taxes) in return for access to resources and service. Undoubtedly, this needed a further development and growth of the central administration to monitor and plan the economic activities.

By contrast, not all households were under the direct control of the palace/temple institutions and, for instance, urban professionals and craftsmen could retain a good degree of freedom and benefit from access to the sources and services of the redistributive system (see discussions in van Driel 199-2000).[7] Nevertheless, this kind of debate is ultimately difficult to unpick because the lack of documentation from private households does not allow us to estimate the magnitude of the private sector in the pre-industrial economies. In addition, we cannot state that the redistribution was the exclusive system of exchange because it is problematic, if not impossible, knowing all segments of the pre-industrial economies in any period of the Middle East history. In this case uncertainty is not a matter of having enough archaeological and textual data, but it is due to the biased view acquired through the study of institutional archives that did not record property outside their scope.

2.4.3 Craft production

In the old temple-city interpretative model, craftsmen were assumed to be dependent labourers of the central palace/temple agencies, where they would process raw materials provided by those institutions. Then, they delivered their finished work to the temple/palace, which in exchange gave them rations of food and, later on, allotments of land. In this extreme model, craftsmen appear as full-time, dependent workers of the agency, which is also their exclusive "customer", while the rest of the rural population's only task is to produce food. The obvious objection to this model of urban concentration and specialized labour is that we are in fact able to identify clear concentrations of specialized crafts at minor sites such as villages, in family environments, rural communities and so on (Tosi 1984; Costin 1991; Liverani 2000, 46). Therefore, many craft specialists catered for a plurality of different customers and their products were not solely destined for elites' luxury activities, or as treasures to store in the palace or in the temple (Liverani 2005, 55). In this case, a good point has been made by Steinkeller (1996), who notes the dispersion of specialized potters across the territory rather than of a concentration in the palace and temple agencies.

Peacock (1982, 6-11) provided a scheme about the organization of craft production, which ranges from a small domestic production to a larger institutional scale of production. In many early-complex societies most craft production was done in private

[7] Perhaps the dependent labourers such as the craftsmen did not fully rely on institutional rations for their survival, but they were given rations only part of the year (Steinkeller 1996).

houses (household industry) or in specialized workshops (Feinman and Nicholas 2000) by independent artisans that worked on their own and distributed their products individually, and artisans working for patrons and mostly producing luxury goods for elites (Brumfiel 1987; Clark 1997). Among the interacting factors determining the juridical status of various crafts and the degree of centralization we can include the following: 1) Types and destination of the finished products (normal widespread for entire population's common use or exclusive distribution monopolized by palace/temple institutions); 2) intensity of craftwork (part-time vs. full-time work); 3) technical skill required; 4) availability, value, and provenance of raw materials; 5) size of work force.

For example, pottery making required a ubiquitous easily available raw material (clay), low technical skills, and a variety of customers (palace/temple institutions and private households). On the other hand, items of jewellery were destined to an exclusive and selective market, required high technical skills, they were produced with expensive and exotic raw materials in institutional (full-time craftsmen working for the palace or temple) or attached workshops (independent craftsmen working for patrons or elites). Therefore, in the pre-industrial complex economies of the Middle East crafts were either dispersed in the rural villages and carried on by individual families, or they were concentrated and affiliated, in the case of most important and complex productions, with the central state/temple institutions that were the largest consumer of finished products, the best concentration of working personnel and the most effective gatherer of far exotic and expensive raw materials (Neumann 1987; Liverani 2005, 56; Fig. 2).

2.5 Economic policy and interregional interaction

The Middle East and Mediterranean's diversity of available resources and relatively compact geography provide an ideal setting for long-distance international trade. The Mesopotamian region, for example, was characterized by rich yields from irrigated fields, rain-fed agriculture and/or pastoral products but it was seriously deficient in all the major natural sources that played an important economic and political role in ancient complex societies such as wood, stone and metals. Thus, Mesopotamian early complex societies had to acquire their raw materials and high-status items such as obsidian, copper, tin, silver, gold, iron, chlorite, lapis lazuli and lumber from neighbouring or distant regions and/or political entities playing as trade partners. Most of the available raw materials could be found in Anatolia (e.g. lumber, silver, gold, copper) to the north (Yener 1983 and 2000; Larsen 1987, 51); from the Levantine coast (e.g. timber, good clay for pottery) to the west, from the Iranian and Afghan plateaus (especially tin and lapis lazuli) to the east (Cleziou and Berthoud 1982; Stech and Pigott 1986; Warburton 2011, 127-127), and from the Persian Gulf (e.g. copper) to the south (Meyer 2006, 93-95).

As result of the lack of basic raw resources, Mesopotamian history from the eighth millennium BC onwards was characterized by repeated efforts to gain control and access to the resources of neighbouring or remote regions through a variety of different strategies such as trade, gift exchange, colonization, raiding or military conquest (Stein 2005, 146). Three main routes of trade and communications encouraged interregional interactions: 1) a north-south route by the Euphrates River; 2) an east-west route through a series of passes leading from north-eastern Mesopotamia into the Zagros Mountains and the Iranian plateau; 3) and the Persian/Arabian Gulf, linking lower Mesopotamia with Dilmun, Magan (Oman) and the farther Meluḫḫa (Indus Valley; Meyer 2006, 93-94).

Long-distance and large-scale exchange networks connecting Upper Mesopotamia with the Anatolian highlands and the Iranian plateau seem to have emerged with the origin of the early state level societies during the Uruk period, in the second half of the fourth millennium BC (cf. Algaze 1993; Rothman 2001; Beaujard 2011, 10). This period, known only from the archaeological evidence of some sites (e.g. Habuba Kabira, Hacinebi, Jebel Aruda, Godin, Hassek, etc.), was characterized by the spread of commercial outposts/colonies along the trade and communication routes leading to Central Anatolia and Iran. Then, this Uruk colonial network collapsed definitively at the end of the fourth millennium BC for reasons that are unclear. Thereafter, archaeological and textual evidence suggests that during the third and second millennium BC Mesopotamian international change took place through three mechanisms. First, merchants acting as temple/palace trade agents or as private entrepreneurs travelled in the foreign countries for acquiring raw materials and luxury goods. Second, Mesopotamian states acquired foreign goods by indirect exchange, which likely took place in areas close to, but outside of Mesopotamia (Lamberg-Karlowsky 1972). For instance, merchants from Mesopotamia and the Indus valley traded goods on neutral ground at places such as Dilmun, where the local merchants played as intermediaries. Finally, Mesopotamian state authorities favoured international exchange by encouraging foreign merchants to come to Mesopotamia. During Sargon's kingdom (ca. 2350 BC) ships from remote lands such as Magan (Oman) and Meluhha (Indus valley) docked in the quay of the city of Agade (Foster 1977, 39; Larsen 1976, 228).

International interaction it was not only a matter of long-distance trade, but also warfare. However, it is extremely difficult to understand if military campaigns aimed to extend the area from which a tribute could be drawn, to get the control of important land routes, to remove menace from borders, or to impose the king's authority over the entire known world. Possible outcomes of the military conquest and of the imperial presence were the imperial outposts: fortified centres acting as tools of military and administrative control over the lands conquered. Even though Mesopotamian empires could have encouraged trade, commercial activity perhaps was not the driving force of military expansion because imperial revenues derived from tribute imposed over conquered states rather than from commercial enterprises (Oded 1992; Stein 2005, 154).

Another mechanism of international exchange was via diplomacy, where the rulers corresponded with each other in a formal language and by exchanging gifts, rare exotic items and precious raw materials such as silver, gold, tin and ivory (Kuhrt 1995, 101). Diplomacy was important for avoiding violence and for the stability of foreign exchange because "trading ventures which pass through foreign lands need as much neutrality as they can muster" (Postgate 1992, 258). Furthermore, the exchange of princesses for inter-dynastic marriages was used to strengthen the political ties between rulers through blood relations (Feldman 2006, 13-14).

A further form of interregional exchange is represented by the colony as implanted settlement established for long-term residence either in an uninhabited land or in a territory of another distinguishable host society (see Fig. 2). The Old Assyrian (ca. 1970-1700 BC) colonies are a good example of long-distance trade network of commercial settlements operating in neighbouring regions in the Middle Bronze Age.

Two distinct kinds of theoretical approaches have been commonly used for understanding the political economy of interregional interaction: hierarchical and non-hierarchical models. The hierarchical models rely on the assumption of power inequalities that lead to or reflect asymmetric exchange systems between strong foreign colonizers and weak local societies, which then develop in the political, economic and cultural dominance exerted by the colonizers over the local society. Among these theoretical frameworks the most used are the Wallerstein's world system theory and the acculturation models. The world system model (Wallerstein 1974) differentiates the world into two distinct zones: the "core" and the "periphery". The core is highly specialized and developed, while the periphery provides raw material and is indirectly or directly under core's control. This theoretical framework minimizes the role of local hosting polities and/or groups and ignores the local changes and internal dynamics occurring within the periphery whose role and structure was shaped by the long-distance trade undertaken by the core. Acculturation models focus on a process in which smaller, less powerful recipient societies gradually adopt and borrow the culture of the bigger, more powerful recipient societies (Cusick, 1998; Herskovits 1938). This process leads to the disappearance of the smaller group, which is absorbed into the broader culture. Non-hierarchical models reject the assumption that inter-regional interactions are the result of hierarchical and asymmetrically organized advantages of foreign colonizers. Instead, the contact between local societies and colonizing groups can lead to the formation of a new hybrid or creolized culture and identity, which is the mixture of both local traditions and foreign cultural traits (Hannerz 1987; Bhabha 1992, 172-183; Van Dommelen 2005; Larsen and Lassen 2014).

Another kind of non-hierarchical model can be raised via the trade diasporas theorised by Cohen (1969; 1971, 266-267), where Assyrian merchants set up commercial quarters in the hosting Anatolian city-states and retained strong economic and social ties with their homeland. Therefore, members of the same ethnic and trading groups organize themselves into their own corporate entity and political organization coordinating the other diasporas groups, protecting their identity and autonomy, and dealing with their host community and trading partners. The kind of relationships between the host local societies and the foreign colonizers defines three different levels of trade diasporas (Stein 2008, 31-32): 1) marginal status; 2) social autonomy; 3) political dominance. In the first case the rulers of the host communities consider the foreign merchants as a subordinated weak group to be exploited. In the second form the merchant groups, being financially useful to the ruling elites, have they political and economic autonomy granted by the local rulers. In the last case the trading diasporas takes control over its local host community.

A further form of interregional exchange is represented by the colony as implanted settlement established for long-term residence either in an uninhabited land or in a territory of another distinguishable host society. The Old Assyrian (ca. 1970-1700 BC) trade system is a good documented example of long-distance trade network of commercial settlements operating in neighbouring regions. The Old Assyrian colonies occurred in context characterized by city-states operating in highly competitive and politically fragmented landscapes. Strong military pressure did not support Assyrian colonies. Instead, this trade network based its own existence and commercial function in keeping peaceful and good relations with the host local communities that acted as their main trade partners. Undoubtedly, commercial settlements had a crucial role for the political units fostering them: 1) they guaranteed access to strategic resource without reliance on foreign military intervention; 2) they could exert a vertical monopoly on the source areas; 3) they allowed the state to restrict access to prestige goods. Therefore, trade colonization may be the product and one possible strategy of sources procurement of city-states unable to impose substantial military power over long distances (Stein 2005, 150; Stein 2008).

2.6 Summary

This chapter has offered some background of the political and economic structure of early complex societies in Western Asia and introduced a landscape perspective with which we can frame the study of political, material and social trajectories. A key point to reiterate is that exclusive adoption of a pre-constituted theoretical framework privileging distinctions or similarities between modern and pre-modern societies is unhelpful for understanding political and economic processes in Western Asia in the Bronze Age. In addition, the patchy characteristics of both archaeological and textual evidence do not offer an unequivocal picture of past early complex-societies, and we have to try to integrate those two kinds of dataset if we want to detect the structure and the spatial scale of past political and economic landscapes. Thus, in the present dissertation two directions of enquiry seem to be necessary. First, the available archaeological data must be reviewed with the aim of detecting what political, economic and/or social factors could have caused the spread of specific types of material culture and social practices (e.g. pottery, seals, metrology, architecture, burials, urban layout, etc.). Second, the analysis of written sources should provide a picture unveiling the diachronic and spatial development of early polities and their interactions both on local and inter-regional scale. In both cases computational, spatial modelling can also be of assistance. Undoubtedly, political landscapes in Upper Mesopotamia and Central Anatolia in the Middle Bronze Age were affected by radical shifts between political systems (e.g. from peer-polity system of city-states to territorial states) that consequently acted at different spatial scales and with different degrees of pervasiveness and authority. Chapter 4 and 5 will address those issues, while Chapter 6 will try to trace modalities and scales of interaction between various political and trade agencies.

Chapter 3

Upper Mesopotamia and Central Anatolia in the Old Assyrian Colony Period. A Review of the Documentary Historical Evidence

3.1 Introduction

This chapter will provide broad background information, based on the known historical evidence, in order to define a spatial and chronological framework relevant for the aims and the objectives of the thesis. Section 3.2 will introduce the chronological and geographical setting, with a brief review of the most recent updates for Old Assyrian period chronology, which covers the temporal scope of this thesis. Section 3.3 will provide a detailed account of the textual and archaeological evidence from the main cities involved in the trade system set up by the Assyrians: Aššur and Kaneš. The subsequent section (3.4) will offer a broad overview of the political situation in Upper Mesopotamia and in Anatolia during the Middle Bronze Age, based primarily on the texts. This will allow me to introduce the dynamics of political and economic competition occurring among the political entities acting in the area, which are relevant to the research questions defined in chapter 1. The last section (3.5) will provide background information about the structure and organization of the Old Assyrian trade network, as also visible primarily in the texts, which is useful for defining the geographic area in which the Assyrians conducted their commercial activities.

3.2 The Old Assyrian Period: Chronology

The "Old Assyrian" period indicates the earliest phase of textual evidence (and to a lesser extent material culture) associated with ancient Aššur and Assyria during the first centuries of the second millennium BC (Veenhof and Eidem 2008, 19). For several decades, the chronology of the Old Assyrian Period has been uncertain. In the absence of the Assyrian year eponyms (*limum)* we did not know precisely when the Old Assyrian Period started, what was the length of the main period of Assyrian commercial activity and what was the time gap between the level II and level Ib of *kārum* Kaneš. The discovery, in 1998 at the site of Kültepe, of two lists containing about 130 year-eponyms in sequential order has shed dramatic new light on Old Assyrian trade history (Veenhof 2003a). The "Kültepe Eponym list" covers a period starting from ca. 1972 BC to 1718 BC according to the so-called Middle Chronology. The few gaps in this list can be restored thanks to the "Mari Eponym Chronicle" which covers the period from ca. 1872 to 1776 BC (Birot 1985, 219-242; Veenhof 2003a, 57) and reveals that there was a gap between the two documentary corpora represented in *kārum* Kaneš levels II and Ib respectively: around 1835 BC. A new eponym list (KEL G), discovered in 2001 at Kültepe (Günbatti 2008) now makes it possible to refine this chronology even further (Veenhof and Eidem 2008, 28-29). This list, composed of ca. 145 year eponyms, ends around ca. 1718 BC and shows that the period of *kārum* Kaneš level Ib may have lasted ca. 130 years. According to Veenhof (2008) the "Kültepe eponym list" starts with Erišum's kingdom in 1974, the year in which was introduced the institution of the annually appointed *limu*-eponym. Nevertheless, recently Barjamovic *et al.* (2012, 26-28), analysing two late texts providing a count of regnal years between the Old-Assyrian rulers Erišum I and Šamši-Adad I, have proposed that the time span from Erišum I's first year of reign to the death of Šamši-Adad I is 197 years and not 199 years.[8] To summarise, the eponym lists coming from Kültepe and Mari allow us to reconstruct the chronology of the Old Assyrian Period from ca. 1972 BC to 1718 BC.

I would point out, however, that, for the purposes of this dissertation, it is not important to decide if the Old Assyrian chronology moves up or down by 50 or 100 years; instead what is important is the intact relative chronological sequence within the Old Assyrian Period, with its synchronisms with Babylonia and Mari by Šamši-Adad I, with Šubat-Enlil/Šehna via Aššur's treaty, and with a known temporal gap between

[8] Thus, the "Kültepe Eponym List" could have started in 1972 BC and not in 1974 BC.

Kaneš lower town's level II and level Ib. Therefore, in this thesis I will adopt the "Middle Chronology", which is conventionally accepted by most researchers and will use the following subdivision for defining the first and the second phase of the Middle Bronze Age:

- Middle Bronze Age I (2000 - 1800 BC)
- Middle Bronze Age II (1800 - 1600 BC)

Actually, an absolute chronology is difficult to propose and there are many different solutions. Michel and Rocher, after analysing the mention in the Mari Eponym chronicle of a solar eclipse during the year after Šamši-Adad I' birth and dendrochronological data from palatial building in Acemhöyük, proposed that Šamši-Adad I was born in 1836 BC and died in 1760 BC (Michel and Rocher 2000, 111-126). Eder has also proposed an ultra-long chronology, which dates the first year of Erišum I's kingdom to 2044 BC and the Šamši-Adad I' death to 1846 BC (Veenhof and Eidem 2008, 30). Recently, Barjamovic *et al.* (2012, 28-35) have proposed an absolute chronology based on the dendrochronology of the beams used in the construction of the royal palaces of Kültepe's citadel (upper city) and on the assumption that the destruction of the main mound (upper city) and the lower town of Kültepe were part of the same event (Özgüç 1999, 77). The main structures on the mound, the so-called Old Palace (mound level 8) and the Waršama Palace (mound level 7), were the royal residences of Kaneš's rulers and have been respectively dated on the basis of dendrochronology to ca. 2027-2024 BC and ca. 1835/1832 BC (cf. Newton and Kuniholm 2004, 167; Manning *et al.* 2010, 1586). Barjamovic *et al.* (2012, see Appendix 1 for a complete list of eponyms) proposed that the absolute date 1835/32 would match to the relative dates of the Revised Eponym List (REL) 138-141, under the assumption that the timber of the Waršama Palace was immediately used after the Old Palace's destruction. In fact, the latest dated text known from Kültepe's lower town level II belongs to the eponym of REL 138 (Enna-Suen/Aššur, ca. 1835 BC), while the earliest tablet (Günbatti 2008, 117; Dercksen 2011, no. 74) from the lower town level Ib dates to the REL 142 (Šu-Laban, ca. 1831 BC). Therefore, it seems that the transition between the two levels II and IB, evidenced by a thick layer of ashy soil separating the two layers, took place around 1835 (Barjamovic *et al.* 2012; see Fig. 3).

Therefore, the use of Middle Chronology in the Old Assyrian period is based on a series of circumstantial evidence and assumptions: the contemporary destruction of Kültepe's main mound level 8 and lower town level II, the dendrochronological analysis, the sequence of the Revised Eponyms List (REL), and the results of the archaeological investigations at Kültepe. On the contrary, Boese lowers the chronology by half a century on the basis of the synchronism with Egyptian history (2008). A lowered chronology would dissociate the burning of the Old Palace on the upper mound from the event which destroyed the lower town around 1835 BC. The conclusions of this paragraph can be finally summarized in the table showing the sequence of Old Assyrian Kings (Fig. 4).

3.2.1 Assyria during the first centuries of the 2nd millennium BC.

The Old Assyrian period starts roughly around 2025 BC at a time when the state of Ur III appears to have lost control of its northern dominion including the city of Aššur (Veenhof and Eidem 2008, 20). At this point, Aššur became an independent city with its own rulers who, as members of the "Puzur-Aššur dynasty", were now considered governors (ensi = iššiakkum) appointed by the god Aššur, who was the real king of the city. The name Aššur was assigned to the city for the first time at the beginning of the Akkadian period and was also found in several clay tablets coming from Nuzi (Yorgan Tepe, close to modern day Kirkuk; Meek 1922, 11). Actual evidence for a divine name or names containing the element Aššur is not so far attested earlier than the Ur III period (2112 – 2004 BC). Perhaps the god Aššur was the personification of the city and its cult was not practised before the 21st century BC (Oates 1969, 29), but we may surmise that the cult of Aššur was introduced as a local religious cult by a dynasty that wanted to claim its independence.

This period was also characterized by the emergence of the Old Assyrian dialect, which developed out of Old Akkadian during the last centuries of the third millennium BC (Veenhof and Eidem 2008, 21). Other aspects such as specific types of written records, the Assyrian calendar, cylinder seal styles, its social and legal organizations, international trade and other cultural features make ancient Aššur different from contemporary Babylonia.

The earliest phase of the Old Assyrian period is difficult to reconstruct because we can only rely on the scanty tradition embodied in the "Assyrian King List", where the regnal years of several early rulers are missing and where there is lack of some lists of *limu*-eponyms that were used to date records (Veenhof and Eidem 2008, 28).[9] The list of seventeen kings living in tents is a clear attempt to link Šamši-Adad with the nomad rulers and it cannot be considered historically reliable. Among the six kings from Sulili to Ilušuma the list states that "their name appear on bricks but their names eponyms are unknown", while in contrast we know the duration of the kingdoms from Erišum I to Erišum II by the eponyms list. Therefore, the period span starting from Erišum I to Išme-Dagan can be reconstructed more accurately because we can rely on more written and archaeological sources.

Erišum I, Ilušuma's son, made Aššur a tax-free zone for all marketed goods, including silver, gold, barley, copper, tin and wool (Larsen; Dercksen 2004). This measure would have stimulated the role of Aššur as a trade centre bringing together goods coming from southern Mesopotamia and Iran-Afghanistan via Susa for export to Upper Mesopotamia and Anatolia. The discovery of a clay envelope at Kültepe's lower town level II with an impression of Erišum I's seal, confirms without doubt that the Old Assyrian trade was already in operation during his reign (Özgüç 2003, 18). In addition, in 1972 BC Erišum I instituted the system of annual *limmu*-officials whose names were given to the years (Barjamovic 2008, 95). Therefore, after Ilušuma's reign, Assyria was involved in a network of long distance commercial exchanges across Upper Mesopotamia and Central Anatolia (ca. 1970 – 1700 BC). This network was a long-distance socio-economic system with the city of Aššur as its centre and trade links to the south (Babylonia), north (Anatolia), east (Elam, the Zagros area) and west (northern Syria and lower Jazira). The activities of Assyrian merchants during the four kingdoms of Erišum I, Ikunum, Sargon I and Puzur-Aššur III are well documented by archaeological levels II and Ib at Kültepe's lower town, and by the recovery of the Assyrian merchants' private correspondence recording trade transactions, contracts and letters (about 23,000 recovered tablets: e.g. Veenhof 1995a, 860-62; Forlanini

[9] The Assyrian King list is a document, which date to the early first millennium BC, in the Neo-Assyrian period. Assyriologists believe that the list was originally compiled to link Šamši-Adad I, an Amorite who conquered Aššur, to the native rulers of the land of Aššur and to legitimize his power over the whole area (Larsen 1976). This list begins with the names of seventeen kings living in tents: "Total of seventeen kings who lived in tents" (Larsen 1976).

2008). The nature of the relationships between the Assyrian traders and the Anatolian rulers was based on trading pacts and sworn oaths. The Assyrian colonial system was characterized by two kinds of commercial settlements: *kārum* and *wabartum*, with the *kārum* at Kaneš perhaps the most important administrative centre in the whole network. The Old Assyrian trade consisted of donkey caravans, equipped in Aššur, that carried substantial amounts of tin and woollen textiles to Anatolia, where they were sold or exchanged for silver and gold (Larsen 1987).

3.3 A tale from two cities: Aššur and Kaneš

In this section I will introduce the two main cities involved in the trade system set up by the Assyrians. This will allow me to address the differences, in terms of political and social organisation, between those two cities, and in the implications for Assyrian long-distance trade.

3.3.1 The origins of Aššur and its urban organization

Assyria was a zone of intense agricultural activity since the Hassuna (ca. 6900-6500 BC) and Halaf periods (ca. 6500-5500 BC), and was characterized by increasing urbanisation since the late Uruk period. Moreover, it is important to point out that the political and cultural unit known as Assyria is the result of the union of two different geographical areas. The first one is the so-called "Assyrian triangle", within the Greater Zab and the Tigris, with Nineveh as its main urban centre and the second one is represented by the city of Aššur and its environs (Fig. 5). The Assyrian triangle was suitable for these emerging urban landscapes because it was characterized by extensive cultivable lands and water sources that could support a prosperous economy and a considerable population. On the other hand, Aššur was an isolated city, located in an arid zone where the environmental conditions were not suitable for intensive agricultural activity (Altaweel 2008b, 821-822). It was both geographically and economically on the fringe of the main concentration of population, and was exposed to the intrusion of nomadic people from the steppe as new settlers or raiders. This city represented an accessible point for the headquarters of groups who were in the process of settling more permanently, with the advantage that this location controlled important and profitable routes (Oates 1969, 20). The importance of Aššur derives mainly from this strategic position, which gives access to eastern Anatolia by the Tigris, to the western part of the Upper Mesopotamia via the Wadi Thartar, and to the Iranian highlands via the Lower Zab. The union of Aššur and the rich “Assyrian triangle” is perhaps a consequence of both the strategic and economic interests of the Akkadian and Ur III states. This site has its origins in the third millennium BC. On the city mound the temple of Ishtar has yielded five archaeological levels dating to the middle and second half of the third millennium BC. Little is known about the history of the city of Aššur in the third millennium BC. All we can really say is that, in the Early Dynastic III period, Aššur was surrounded by a city wall, that the Ištar’s temple acted as a major religious building, and that the city seems to have been dominated at this time by the powerful Old Akkadian and Ur III states.

Our knowledge about Aššur in the early 2nd millennium BC is still a biased and fragmented picture because only a few isolated written sources exist and few Old Assyrian archaeological strata have been reached in some areas of the city. The old city is characterized by a trapezoidal city plan measuring approximately 40 hectares and is surrounded by both an inner and outer city wall (Fig. 6). To the southeast of the site is located the so-called “New City”, a residential area built during the Middle Assyrian Period that is not well known because the lack of archaeological investigations. The archaeological evidence indicates that the public and religious buildings were mainly distributed in the northern part of the city acropolis, while the residential and domestic areas were located in the southern part of the acropolis or in the lower city. Aššur in the third millennium and in the Old-Assyrian Period was a 30-40 hectares mound characterized by the following features:

- an inner and outer mud-brick city wall;
- a large palace built in the Old Assyrian Period;
- temples of Aššur and Ištar;
- a large ziggurat;
- private houses located in the southern part of the mound.

The city wall was subject to many reconstructions and restoration works over the centuries. The local rulers living in the city perhaps originally built the city wall in the Early Dynastic III period. According to the written sources the city wall was rebuilt and restored by Old Assyrian kings such as Kikkia, Ilušuma, Erišum I, Sargon I and Šamši-Adad I (Larsen 1976). The “Old Palace”, situated in the northern part of the city, was perhaps founded during the Old Assyrian period (Lündstrom 2013, 23). Instead, Invernizzi (1992, 30, vol. II) suggested that this building may have already been built in the Akkadian period because several of its architectural features are very similar to those belonging to Naram-Sin’s palace in Tell Brak. This huge rectangular building measuring 100 by 120 metres was characterized by a large central court, which had on its southern side a throne room. The eastern wing of the building, instead, is characterized by a long corridor sided by two rows of small rooms that likely hosted administrative offices and archives. Perhaps, the Old Palace of Aššur, during the Old Assyrian period, was the official residence and the administrative quarter of the Assyrian kings.

The most important religious buildings in the Old Assyrian Period were the temple of Ištar and the temple of Aššur. The temple of Ištar, on the basis of our current archaeological information, is perhaps the oldest religious building at Aššur. The archaeological investigations directed by Andrae between 1903 and 1914 discovered several overlapping layers demonstrating the long history of this cult centre (see Andrae 1922). The building was, most likely, founded during Early Dynastic III (2600-2350 BC) and was the object of several re-buildings and restoration works. One inscription tells us that Erišum I re-built and carried out several restoration works for Aššur’s temple. An important re-building of Assur’s temple occurred under Šamši-Adad I (1808-1776 BC). The temple was a large rectangular building measuring 108 by 54 m, which had in front of the main façade a trapezoidal court delimited by a wall. An inner central court, accessible by two main gates sided by towers, characterized the religious building. It is important to point out that this temple kept the same plan and the same architectural features from the Old Assyrian Period until its destruction in the 7th century BC. This demonstrates the traditional and national aspect of the cult of Aššur and the absence of many obvious innovations in architectural style during the Middle and Neo Assyrian Periods.

To summarise, Aššur in the Old Assyrian Period was a city with an extent of about 30-40 hectares characterized by a well-fortified city wall, a huge palace and two important temples devoted to the gods Aššur and Ištar. Unfortunately, most of the site has not been investigated archaeologically, so that we do not have much evidence concerning the residential areas in the Old Assyrian period, which may shed new light at the social and economic organization of Aššur.

3.3.1.1 The City Hall of Aššur

Unfortunately, the Middle Bronze Age remains of the Old Assyrian City Hall, the main institution in Aššur concerned with affairs of trade, have not yet been found. In the absence of texts from the institution's own archives, the clay tablets discovered in the lower town at Kültepe represent our unique source of information about the City Hall (Dercksen 2004, 6). Archaeologists have, however, proposed three buildings as possible locations for the City Hall: the so-called *Schotterhofbau* below the Old Palace, the Old Palace itself, and the Middle Assyrian administrative building. Nevertheless, the lack of written sources and the scanty amount of the archaeological data do not allow us to surely identify which if any of these buildings was the City Hall. In any case, the City Hall played an important role at Aššur, both for the export trade with Anatolia and for the local economy and home industry. This institution played an important role in the sale of luxury commodities destined for export such as lapis lazuli and iron, and in the export of tin and textiles, the main goods traded by the Assyrian merchants. Nevertheless, it is not clear how dominant was the influence exerted by the City Hall. The texts tell us that the City Hall's activities were not only export-oriented, but that the institution dealt with the local economy by controlling the granary of the city and selling copper (Dercksen 2004, 23). The City Hall also functioned as creditor for the merchants and their families, and like any other creditor it could demand that some individuals, such as important inhabitants of Aššur, act as someone else's financial guarantor. The director and manager of the City Hall, the acting year-eponym, was personally responsible for the credit that he granted, and apparently on his own initiative, he urged people to pay back their debts. Defaulting debtors could face the confiscation of the house or of all of their possessions. The public function of the City Hall can be summarized thus:

- Collecting certain taxes;
- Checking the purity of metals;
- Storage and sale of barley;
- Guaranteeing the market for export trade;
- Provideingcredits for the merchants involved in the trade;
- Custodian of the treasure of the god Aššur;
- Custodian of the city-state archives.

3.3.2 The city of Kaneš

The key archaeological site both in terms of the amount of data yielded (textual and archaeological evidence) and for the role played during the Old Assyrian period is Kültepe (the ancient Kaneš or Neša), located 19 km north-east of Kayseri. This site, whose excavation began in 1925 under the direction of the Turkish archaeologist Hrozný and then of T. Özgüç from 1948 onwards, is one of the largest mounds in Anatolia and is characterized by two main areas (fig. 7):

- Kültepe Höyük, a 20 metres high circular mound measuring approximately 30 hectares in size. This was the site of the Anatolian settlement dominated by the royal palaces of its rulers (Özgüç 1999, 79-114). Recently Barjamovic (2014, 61) has proposed that Kültepe, comprising the lower town, could be larger than 170 hectares. To the basis of the scanty available archaeological evidence it is still early to state it with certainty but it is a worthwhile suggestion to follow in future directions of research.
- Kültepe lower town, a lower lying area located on the north-east rim of the main mound measuring roughly 9 hectares of extent, was a residential quarter (Hertel 2014, 27). This quarter has yielded a collection of private houses inhabited not exclusively by Assyrian merchants but also by many Anatolians (Özgüç 1986, 1-21; Sagona and Zimansky 2009, 227).

The archaeological excavations carried out in the main mound have discerned 18 building levels numbered from the top down. Levels 18-11 date to the Early Bronze Age, levels 10-6 span the Middle Bronze Age and levels 5-1 cover the period from the Iron Age to the Roman Empire (Fig. 8). It is possible that the main mound was not occupied during the Late Bronze Age (Kulakoğlu 2011b, 41).

Several palaces were discovered on the main mound. One of these, the Old Palace, is located near the centre of the mound (Ozgüç 1999, plan 3; Fig. 9). The dendrochronological analyses of the beams used in its construction have allowed archaeologists to date it to ca. 2027-2024 BC (cf. Newton and Kuniholm 2004, 167; Manning *et al.* 2010, 1586; Barjamovic *et al.* 2012, 29). In addition, the pottery and clay tablets discovered inside the building, typical of Kültepe's lower town level II, suggests that the palace was used until its destruction occurred in ca. 1835 BC. From the textual evidence, we know that merchants brought their shipments to the royal palace, and it is likely that the unloading took place in the central area of this apparently circular building (Sagona and Zimansky 2009, 236). The later Palace of Waršama, probably built in ca. 1835/1832 BC (see Barjamovic *et al.* 2012, 29), overlaps with the earlier Old Palace and shows a different plan (Fig. 9). It has a square layout with each side measuring 100 m and outer walls made of large stones. The walls were buttressed at regular intervals and one entrance opens on the western side, even though a further gateway, probably destroyed by a later building, may be located on the south of the palace. Rooms on the northern and north-western side of the edifice could be interpreted as storerooms, while the thickness of the walls suggest the presence of a second floor, which likely hosted the royal residential quarter. Rooms on the eastern and southern sides of the palace were destroyed and it is difficult to understand what kind of functions where performed inside them (Özgüç 1999, 79-91). This palace, with its extent of one hectare, is the largest royal building known in the whole of Anatolia during the Middle Bronze Age and reflects the social and political status of the local rulers living in it. Seals, sealings and pottery date its occupation period contemporary to the level Ib of Kültepe's lower town.

Four main occupation levels characterize the Kültepe's lower town (Fig. 8). The earliest two, levels IV and III, belong to the late third-early second millennium BC but they have not yielded any clay tablets. A fire destroyed level III during the Early Bronze Age III phase (Bryce 1999, 23). Levels II and Ib belong to the Middle Bronze Age, the period of the Old Assyrian colonies, and have yielded a huge amount of textual and archaeological evidence. These two layers can be accurately dated because a large amount of texts coming from Kültepe, Alişar Höyük and Hattuša use the eponym *limum*, an Assyrian official appointed yearly at Aššur, and regularly used as a dating formula. It is possible to determine the chronological sequence of Kültepe's lower town tablets by synchronizing the eponym *limum* lists with the historical events known from the Asssyrian and Babylonian chronicles (Barjamovic *et al.* 2012, 24). Therefore, the two levels can be dated according to the following chronology: [10]

- Level II (ca. 1970 – 1835 BC);
- Level Ib (ca. 1835 – 17th c. BC).

The great majority of written sources (ca. 23,000 clay tablets) come from the level II, while the level Ib has only yielded about 500 clay tablets. Level II was violently destroyed likely around 1835 BC. How can we explain the destruction that occurred in this level? We know from a text called the Anitta inscription that the kingdom of Kaneš/Nesa was attacked, conquered and finally looted by Uhna, the ruler of the northern kingdom of Zalpa (Balkan 1957, 8). This conquest may explain the destruction that occurred at Kültepe's lower town around 1835 BC. Nevertheless, it is not still clear if the settlement on the mound suffered the same destruction experienced in the lower town.

At Kaneš, the lower town was composed of private houses, distributed along irregular streets and open squares, inhabited by both Assyrian and Anatolian traders (Fig. 10). It has been commonly accepted that there is no obvious architectural difference between the houses of the two populations and the Assyrian presence is only discernible by the retrieval of clay tablets (Özgüç 1963; Sagona and Zimansky 2009, 231-32). However, I would like to be more cautious and point out that only limited

[10] Dates are expressed according to the "Middle Chronology".

comments about architecture and no full assemblages of portable material culture have been published, so that it is difficult to say if there might be distinctions at the assemblage level. Even though the most visible architecture and preserved artefacts are clearly in local Anatolian style, a comparative analysis of the animal bones recovered from household refuse seems to show ethnic distinctions in food preferences and preparation techniques between Anatolians and Assyrians (see Atici 2014).

Some houses were mainly built according to an Anatolian construction technique characterized by the use of large amounts of timber laid both horizontally and vertically as poles to reinforce the structure, and by quite high stone foundations forming the base of the walls. The houses were two-floor, single-family dwellings with a rectilinear form based on a two-room ground plan to which an open courtyard or other rooms could be added. Unfortunately, the upper floors of the private houses are completely lost, while the ground floors with kitchen, courtyard and workplaces have yielded ovens, storage facilities, hearths and a wide pottery repertoire.

The houses on the ground floor had a well-constructed strong room (known in the texts as the "sealed/guarded room"), where merchants stored trade goods, gold and silver, precious objects and their archives. The clay tablets were collected in jars, baskets, wooden boxes and shelves located along the walls. It is worth pointing out again that written sources found in Kültepe's lower town come from the private houses of the merchants, and by contrast, we only have a very few clay tablets from public and institutional buildings. In all, about seventy distinct private archives, ranging from small collections of a few tablets to large assemblages of more than a thousand documents, have been found. These archives consist of letters, memoranda, contracts, judicial records and business reports. While most written sources belong to the Assyrians, there are some archives of Anatolian merchants, clients and suppliers of Assyrian traders. This shows that Kültepe's lower town was a residential and commercial area inhabited not just by Assyrians, but also by local people and merchants of varied origins (Veenhof 1995a, 861; Hertel 2014).

3.3.2.1 The kārum of Kaneš

The central point of the administration of an Assyrian commercial settlement abroad was the *bit kārim*, the house/office of the *kārum*. The texts from Kültepe show that the city of Kaneš was at the top of the hierarchy of the trading system established in Upper Mesopotamia and Anatolia (Veenhof 1995a). Nevertheless, no Assyrian colony has ever yielded the remains of any *bit karim*. Kültepe's lower town has only yielded the remains of merchants' private houses, but it is important to point out that the past archaeological investigations focused only on the eastern part of the lower town. It has been suggested that one should look for such a building in the western part of the lower town, an area that has never been dug (Dercksen 2004, 103). Although its location in the lower town cannot be determined, we know that the *bit kārim* was a large building hosting offices, the meeting room of the assembly and storage rooms. We have many juridical verdicts showing a bicameral structure comprising a primary and more restricted assembly. Some large clay tablets containing the so-called Statutes of the *kārum* distinguish between "big" and "small" members of the assembly, but it is not clear who belonged to which group and why. Most likely, the "big" men were the richest merchants, the heads of the Assyrian firms in Anatolia (Veenhof 1995a, 868). The licensed merchants paid the *dātum* by depositing merchandise such as textiles and silver. A system of *dātum* contributions also existed in the *kārum* of Purušhaddum. There is not enough information concerning the purposes of this contribution, but we know that part of it was used for promoting communal trading activities (Dercksen 2004, 246).

The *kārum* of Kaneš exerted authority concerning political, administrative and juridical matters. The *kārum* had strong contacts with the mother city of Aššur, whose orders and verdicts first arrived in Kaneš, and then they were transmitted to the other colonies of the trading system. Administrative tasks included registration and juridical duties, because a *kārum* functioned also as court of law, and one could appeal decisions by other *kārus* to Kaneš' *kārum*. In some cases the *kārum* exerted its authority by interrogating persons, by inspecting documents and by demanding witnesses or depositions under oath (Veenhof 1995a; Veenhof and Eidem 2008).

3.4 Political Geography in Middle Bronze Age Mesopotamia and Central Anatolia.

Several competitive political entities were distributed throughout the Near East from Iran to the Mediterranean coast during the Middle Bronze Age (2000-1600 BC). Their rulers, involved in ever-shifting alliances, fought each other in order to gain power and control over strategic resources and territory. In the Middle Bronze Age I, the typical political structure was the city-state. However, by the Middle Bronze Age II period, we have polities dominating larger territories within a more centralized bureaucratic system (Van De Mieroop 2007, 86). Nevertheless, there is not a clear chronological division between the first phase characterized by greater political fragmentation and the second one characterized by greater centralization. The problem, of course, is distinguishing what belongs to the MB I and to the MB II in the archaeological survey record. Below, I will nonetheless explore these two phases separately in order to show how political geography changed in Mesopotamia and Anatolia in the first half of the second millennium BC.

3.4.1 The Middle Bronze Age I

The surviving cuneiform corpus from Upper Mesopotamia has yielded few textual clues for the first two centuries of the 2nd millennium BC. On the other hand, the scantiness of written sources from the first two centuries of the second millennium BC (*ca.* 2000-1800 BC) contrasts with its richness in the 18th century BC. In fact, the archives from Tell Leilan, Tell al-Rimah, Mari, Tell Šemšara and Chagar Bazar have provided a large amount of data for reconstructing the political and economic geography of Northern Mesopotamia in the 18th century BC. Tell Leilan's Eastern Lower Town Palace archive has yielded 600 clay tablets (e.g. administrative texts, letters, and political treaties) retrieved during the archaeological excavations carried out in 1985 and in 1987 (see Eidem 2010). These documents are important for reconstructing the history of Šubat-Enlil/Šehna during the period of its last three kings Mutiya, Till-abnû and Yakūn-Ashar (*ca.* 1750-1728). Mari has yielded a huge amount of written sources (*ca.* 22,000 clay tablets) that have allowed the scholars to reconstruct the political geography in the Middle Euphrates and in Northern Mesopotamia during the period of

Yashmakh-Addu and Zimri-Lim's kingdoms (*ca.* 1800-1758 BC). Other texts come from Tell Šemšara (146 clay tablets from the palace; see Eidem 1992; Eidem & Laessøe 2001), Tell al-Rimah (69 clay tablets from Ishtar's temple and ca. 200 texts from the palace, see Dalley et al. 1976; Dalley 2002), Tell Taya (2 clay tablets, see Postgate 1973), Chagar Bazar (218 clay tablets; see Talon 1997; Tunca & Lacambre 2002), Tell Ashara (ca. 550 cuneiform tablets almost entirely unpublished, see Rouault 1984 and 1992), and Tell Bi'a (ca. 380 texts exclusively from the palace "A", see Krebernik and Strommenger 1998).

Our knowledge of Anatolian cities, town and villages is restricted because the written sources provide us with only a few hundred names that, unfortunately, are problematic to identify and locate geographically. The political status of several towns is still unclear for lack of information due to the fact that either they were not important or they did not have any political or commercial relationship with the Old Assyrian colonies. Most written sources (ca. 23,000 clay tablets) come from the archaeological site of Kültepe and a few hundred from other sites in central Turkey. In fact, seventy-two clay tablets were found in the lower town of Bögazköy (Dercksen 2001: 49-60), sixty-three from Alişar Höyük (Dercksen 2001: 39-49), one from Kaman Kalehöyük (Yoshida 2002) and another one from Kayalıpınar (Sommerfeld 2006). These documents were the medium by which Assyrian merchants recorded their business transactions and were written in cuneiform script in the Assyrian dialect of the Akkadian language.

However, we know from the written sources at Kültepe that the political situation in central Anatolia was also characterized by several kingdoms distributed in five different zones: the Middle Euphrates (Batna, Hahhum, Mamma, Nehria, Uršu, Zalpa); the south-eastern Anatolia (Hurama, Tegarama, Timelkiya); the territory within the Kızılırmak basin (Amkuwa, Kaneš, Samuha); Konya plain (Purušhaddum, Šalatuwar, Ulama, Wahšušana); the Halys region (Durhumit, Hattuš, Karahna) and the Pontus (Zalpuwa). Considering Anatolia's geography, the city-states were mainly distributed in intermountain valleys and were separated from each other by geographic features such as mountain chains, rivers and lakes. Thus, central Anatolia was characterized by the presence of several kingdoms ruled by local dynasties, even if we cannot accurately define the authority and the importance that each of these kingdoms had at the beginning of the second millennium BC. From the written sources we can assume that at some point, some cities such as Kaneš, Wahšušana, Kuššara and Purušhaddum played a more important role, but the overall situation during the level II of Kültepe's lower town was characterized by a political balance among the Anatolian city-states (see Larsen 1972; Michel 2001 and 2008; Bryce 2005, 34-35; Veenhof and Eidem 2008, 147-179; Barjamovic 2011a, 6; Barjamovic *et al.* 2012, 44-48).

3.4.2 The Middle Bronze Age II

In the Middle Bronze Age II several short-lived regional states were able to take control over larger territories as a consequence of individual military successes (fig. 11). Šamši-Adad conquered Aššur in 1808 and then extended his dominion westward to Tuttul on the Balikh River, and he founded a new royal capital at Šubat-Enlil, modern Tell Leilan (Fig. 11; Villard 1995, 873; Charpin and Ziegler 2003; Van de Mieroop 2007, 107). In order to control a so large kingdom Šamši-Adad I (1808 – 1776 BC) put his sons on the throne at two strategic locations. The eldest, Išme-Dagan, was appointed king of Ekallatum, while the younger Yasmakh-Addu became king of Mari. Išme-Dagan (1775 – 1761(?) BC) had the power to control the region between the Tigris and the Zagros, Yasmakh-Addu controlled areas along the Euphrates, the Khabur and Balikh rivers. Šamši-Adad I died around 1776, maybe in a battle after being attacked simultaneously by Yamkhad and Eshnunna, or of natural causes. Išme-Dagan inherited the kingdom of his father but was only able to protect Assyria's traditional territorial heartland. Instead, Yasmakh-Addu was defeated by the king of Yamkhad Yarim-Lim. Zimri-Lim (1780 – 1758 BC) became the new king of Mari and established his power on the Euphrates by several political treaties with the kingdoms of Ilansura, Ashlakka, and Andariq.

Upper Mesopotamia once again became a patchwork of several small city-states, while Ešnunna controlled the area south-east of Aššur. Around the end of the nineteenth century, the kingdom of Yamkhad took control of a large part of north-western Syria during the reigns of the Yamkhad kings Sumuepukh and Yarim-Lim (ca. 1790-1770 BC).

This kingdom, with its capital at Aleppo, extended its power over Ebla, Emar Alalakh up to the Balikh River. Other cities such as Karkemiš, Uršum and Qatna remained independent.

During the last decades of Šamši-Adad I' kingdom, the throne of Babylon was held by Hammurabi (1792-1750 BC), whose predecessors were able to create an independent regional state including within its territory Sippar, Kiš, Dilbat, and Marad. Hammurabi I, via several military campaigns, unified the whole southern Mesopotamia and defeated Elam, Larsa, Ešnunna and Mari in succession, thereby obtaining the control of Middle Euphrates included the kingdoms of Mari and Ešnunna. After that he proclaimed himself as "the king who made the four quarters of the Earth obedient".

In the 18th century BC the conflicts gradually changed the political landscape of Central Anatolia from a patchwork of small numerous city-states fighting with each other to the rise of sizeable territorial states framed into opposite alliances (fig. 11). Important political changes occurred to the south of the Taurus around 1775 BC, when Mamma expanded its territory by conquering Zalwar, Uršu and Haššum (Miller 2001). In Central Anatolia Kaneš imposed its power over Amkuwa, Lakimišša, Salahšuwa and Taišama. Thanks to Anatolian legal documents it is possible to reconstruct the Kaneš's kings sequence in the 18th century BC: Hurmeli (?-1790 BC), Inar (1790-1775 BC), Waršama (1775-1750 BC), Pithana (1750-?) and his son Anitta (?-1725 BC), and Zuzu (1725-?) (Barjamovic *et al.* 2012, 35-40; Dercksen 2004b; Forlanini 2004 and 2008; Veenhof 2008b, 167-173). An important piece of evidence, which sheds light on the history of Anatolia in the eighteenth century, is a Hittite document, the so-called Anitta's text *res gestae*, whose earliest surviving version is a copy made during the Hittite Old Kingdom, about one and half century after the original (c.f. Hoffner 1980, 291; Carruba 2003). This text tells us that Pithana the king of Kuššara, a city likely located to the southeast of Kızılırmak basin, conquered Neša (Kaneš) and captured its king Waršama. Then, Pithana moved the capital of his kingdom to Neša. After his death, while still in the process of consolidating his new conquests, some of his vassal cities rebelled in order to get their independency, but their revolt was crushed by Pithana's son and successor Anitta (Hamblin 2006, 293). Furthermore, Anitta extended its kingdom's territory by undertaking military campaigns northward against Zalpuwa and Hattuša and westward against Wašhaniya, Ulama and Šalatuwar. Thus, by the end of his reign (ca. 1725 BC) Anitta was effectively ruler over the southern half of Central Anatolia, and he took the title of Great King (Barjamovic *et al.* 2012, 50). However, Anitta's power was not long to last, and a successful revolt of vassal cities raised around his death (ca. 1725 BC) resulted in the destruction of Neša and in Anitta's kingdom collapse (Hamblin 2006, 294). The political landscape of Central Anatolia returned instable and fragmented, and in this new situation Zuzu, king of Alahzina, took himself the title of Great King and ruled at the end of the 18th century BC (Barjamovic *et al.* 2012, 51)

3.5 The History and Organization of the Old Assyrian Trade System

3.5.1 Origin and definition

By the early second millennium BC, Assyrians established a network of about forty commercial settlements in Anatolia. The available written sources allow us to look no further back the kingdom of Erišum I (ca. 1972-1933 BC), the king who declared the city of Assur a free-trade zone for all marketed goods such as copper, gold, silver, tin, barley and wool (Barjamovic 2008, 95).

Most historians and archaeologists define this phenomenon as the "Old Assyrian Colony Period," where the term colony indicates the commercial settlements in which the Assyrian merchants lived while carrying out their business abroad. Nevertheless, the meaning of the word "colony" is still debatable and can prompt heated discussion because in many cases people still implicitly or explicitly have an image of modern 16th-19th century AD colonialism. This latter view has also led to some misapplication of hierarchical models of inter-regional interactions. For example, in the case of the Old Assyrian trade, Allen (1992) misleadingly characterises the trade in terms of world system theory and assumes the dominance of an Assyrian "core" over an Anatolian "periphery" involving asymmetric and unequal trade. In fact, as shown in the previous chapter, the Old Assyrian colonies may better match Cohen's trade diaspora model (1971, 266-267). For the purposes of this research, I will refer to colonialism as "a process where material culture moves people, both culturally and physically, leading them to expand geographically, to accept new material forms and to set up power structures around a desire for material culture" (Gosden 2004, 153). From this unity of desire, colonialism variegates into a wide range of types. In this perspective, the middle ground suggested by White (1991) and then adopted by Gosden (2004, 31) explains quite well interactions between Anatolian and Assyrians "as mutual beneficial exploration of differences" between the local natives (Anatolians) and the new incomers (Assyrians). The crucial element in the Old Assyrian trade network is that two distinct communities (Anatolians and Assyrians) have three levels of interaction (see Larsen and Lassen 2014, 174-178): 1) diplomatic and political (treaties and sworn oaths); 2) economic; 3) private (marriages between Assyrian merchants and Anatolian women).

In this context, the Anatolian rulers and the Assyrian merchants were given structure via treaties in order to minimize possible conflicts that might destabilize the political and hierarchical order (Rowlands 1998, 226). Struggles and conflicts between the rival Anatolian city-states were the result of competition for the control of natural resources and adjacent territories. In addition, factors influencing the nature and the structure of long distance trade depended also on the physical distance between the trading partners involved in the trade network. This aspect makes me state that there was a great potential range of contacts and interactions among the Old Assyrian colonies.

The study of written sources has allowed scholars to approximately date the beginning of the Old Assyrian socio-economic system to the twentieth century BC. Nevertheless, the origin of this trade network is still debatable and controversial. It may well go back at least as early as the second half of the third millennium BC, when the Akkadian Empire (ca 2350 – 2150 BC) and Ur III dynasty (2112 – 2004 BC) established highly centralised structures in Upper and Lower Mesopotamia. Early trade connections between Akkadian Mesopotamia and Anatolia are suggested by the presence of objects discovered in levels 11-13 of the city mound at Kültepe. Ozgüç states that perhaps Kaneš in the Old Akkadian Period had developed economic and cultural connections with Mesopotamia and Northern Syria, on the basis of the spread of eastern inspired Syrian bottles and western inspired *depas* (Özgüç 1963, 2; Özgüç

1964, 48; Özgüç 2003, 29).[11] From the 1960s onwards it had been sporadically suggested that the EBA contacts between central Anatolia and Upper Mesopotamia/Cilicia may have been the precursors of the later Old Assyrian Colony network (Özgüç 1963; Mellaart 1982; Efe 2002 and 2003; Şahoğlu 2005; Bachhuber 2012), essentially on the supposition that the Middle Bronze Age trade infrastructures and socio-economic structures must have had a process of development in the latest centuries of the third millennium BC. However, only Bachhuber has tried to analyse in more detail the issue and to explain the reasons of this assumption, by suggesting strong similarities in the mechanisms of exchange (metal for luxury goods) in both periods (2012). Even though the lack of evidence coming from the levels IV and III of Kültepe does not allow us to decide if the people settled there were Assyrians or not, there is no doubt that Aššur had a long commercial tradition. In fact, one Assyrian merchant is attested in a text from the Ur III period, when Aššur was the seat of an imperial governor (*ensi*). Trade of specific products such as textiles, woods and barley is well attested during Ur III, and the export of those products through commercial agents in exchange for silver and stone from Magan represented a good deal for the southern Mesopotamian state (Larsen 1987, 48-49). It is possible those merchants from Aššur may have also been involved in this trade system and that some administrative and bureaucratic aspects of the Old Assyrian trade originated at the end of the third millennium BC (Barjamovic 2011a, 4-5).

3.5.2 The structure of the trade

The Old Assyrian trade network was a long-distance socio-economic system with the city of Aššur at its centre and trade links to the south (Babylonia), north (Anatolia), east (Elam, the Zagros area) and west (northern Syria and lower Jazira). The activities of Assyrian merchants are well documented by archaeological levels II and Ib at Kültepe's lower town, and by the recovery of their private correspondence recording trade transactions, contracts and letters (Veenhof 1995a, 860-62; Forlanini 2008). The Assyrian colonial system was characterized by two kinds of commercial settlements: *kārum* and *wabartum*. The first one represented the main core of the Assyrian

[11] Goodnick Westenholz has recently stated that the relations between Old Akkadian Mesopotamia and Anatolia may have been of a commercial nature (Goodnick Westenholz, 1998, 13-19).

presence in Anatolia and Syria, while the latter one had a subordinate role, even though it enjoyed certain fiscal and juridical powers. The word *kārum* is a term of Mesopotamian origin used for indicating a dock or harbour, where it was possible to offload the goods (e.g. agricultural products, imports from abroad, etc.) transported by boat to cities located along waterways (Veenhof 1995a, 866-67). The term soon acquired the meaning of "trading, business quarter", a commercial quarter in which Anatolians, Assyrians and other foreign businessman lived and worked. As we have previously said, the *wabartum* was hierarchically subordinated to the *kārum*, but it is not still clear if it was the smaller size and political role played by the town hosting the commercial quarter or the strategically less important location of the colony that determined its status, or both. Although not all *wabartus* were attached to minor towns, the distinction between two kinds of commercial settlements and their distribution may reflect a pattern of trade. Such commercial settlements perhaps were strategically located in towns that could have been important road-stations, markets, production centres of goods (e.g. wool, copper, silver, etc.), political centres, or a combination of all/some of these characteristics (Veenhof and Eidem 2008, 164). The importance of a

The texts from Kaneš tell us that the Assyrians established about forty commercial settlements in Upper Mesopotamia and Anatolia (Figs. 12 and 13), but they do not explain the choice of these towns, nor the reasons concerning the different status between the two colonies or how they changed their role over time. Undoubtedly there must have been specific commercial and strategic reasons for the settling down of groups of merchants in particular towns. Those towns may have been road-stations located strategically close to particular geographical features (such as mountain passes, river crossings, road junctions, etc.), or market places, important cities, production centres of particular goods, and in some cases could be a combination of all of these factors. From textual evidence, we know that several centres such as Luhuzattiya, Tišmurna, and Purušhaddum were big producers of wool, a good that was often exchanged for copper (Lassen 2010, 168-171). The cities of Purušhaddum and Durhumit were respectively important markets for silver and copper (see Garelli1989; Dercksen 1996, 151-154; Veenhof and Eidem 2008, 195).

One of the most crucial aspects of the trade was the establishment of political and economic treaties between the Assyrians and the Anatolian city-states. These bilateral treaties allowed locals ruler to impose taxes and fiscal control on the goods imported by the merchants in exchange for protection of caravans travelling across his land. For this reason, a stable political situation was an important pre-requisite for the proper development of trade, and in the interests of Assyrians and Anatolian rulers (See Veenhof and Eidem 2008, 183-200).

Most of the known *kārum* are those identified in the texts coming from Kültepe level II, but we do not know when and how they were founded. Most likely, Kaneš was the first city where the Assyrians established a permanent commercial settlement for its political and economic position in central Anatolia in the early Middle Bronze Age. This would be confirmed by the role played by Kaneš as administrative centre in the Old Assyrian trade network and by the establishing of commercial colonies in Upper Mesopotamia on the way to Kaneš, such as Eluhut, Nehria, Hahhum Uršu and Zalpa.

It is extremely difficult to map the development of the Assyrian colonies during the Middle Bronze Age. It is important to point out that the quantity of texts (ca. 500) coming from the later level Ib of Kültepe's lower town is poor by comparison with the huge amount of clay tablets (ca. 23,000) from earlier level II. In addition, even among the texts found in lower town's level II there is a skewed distribution because most of them belong to the time span ca. 1893-1863 (see Barjamovic *et al.* 2012; Fig. 15). As result, the study of the texts provides a detailed picture of the Old Assyrian trade only in a thirty-year period spanning from the 1895 to the 1865 BC (Barjamovic *et al.* 2012, 55-57).

In the past, it has commonly proposed that the Assyrian trade system, after the destruction of its main hub (Kaneš), may have totally or partially ceased its commercial activities in Anatolia for at least one generation (between ca. 1830/20-1800), until Šamši-Adad I restored it (Veenhof 1995, 865; Dercksen 2001; Veenhof and Eidem 2008, 140; Barjamovic 2008, 96). Nevertheless, we cannot relate the collapse of the whole trade network with the local events that destroyed Kaneš around 1835 BC. As we have showed above, Kaneš's lower town was apparently soon rebuilt after its distruction (ca. 1835 C; Barjamovic *et al.* 2012, 28-29), and dated texts from Kültepe's lower town level Ib show that the Assyrian Trade System was active before Šamši-Adad I's kingdom. Thus, on the basis of both the archaeological and textual evidence there is no reason to think that the Old Assyrian trade system collapsed around 1830/20 BC and was then restored one generation later by Šamši-Adad I (see Barjamovic *et al.* 2012).

The small amount of written sources (ca. 500) from Kültepe's lower town level Ib, has made scholars suppose that the Assyrian trade in the last quarter of the 19th century and in the 18th century could have known a general impoverishment discernible in a diminished volume of merchandise (Balkan 1955, 43; Dercksen 2001, 66; Veenhof and Eidem 2008, 212-218). In addition, Dercksen stated that the Old Assyrian trade network, during the Kültepe's lower town level Ib period (ca. 1835-17th c. BC), contracted within the Kızılırmak's bend and in south-eastern Anatolia (Dercksen 2001, 66). By contrast, this last supposition has been confuted by three texts (two juridical records and one letter) found in the level Ib of Kültepe's lower town quoting the western cities of Wahšušana, Šalatuwar and Purušhaddum (Barjamovic *et al.* 2012, 76). On the other hand, data outside the scope of the Old Assyrian texts appear to contradict the picture of a commercial decline. In fact, a group of letters from Mari and Tell al Rimah, respectively dated to around 1769 BC and 1753 BC, show that Kaneš and Assur had political and commercial contacts and that the long-distance Assyrian trade system was still active (Guichard 2008; Dalley et al. 1976; Barjamovic *et al.* 2012, 76-77). In addition, texts discovered in the "East Palace" at Tell Leilan and contemporary with the layer Ib in Kültepe's lower town do describe political interactions between Aššur and the Syrian kingdoms. The city of Šubat-Enlil/Šehna (Tell Leilan) was the seat of an Assyrian *kārum* and the most important evidence for Assyrian presence from this city is a clay tablet with the text of treaty between the city's king Till-Abnû and Aššur (Eidem 1991, 185-207). Another reason to mistrust the idea of a contraction and decline of the Assyrian trade system is that in some texts from level Ib, a few *wabartus* such as Hanknak, Kuburnat, Šamuha, Šuppiluliya and Wašhaniya upgrade as *kārus*, probably as consequence of shifts in the political and commercial landscape.[12] The example represented by those five Assyrian commercial settlements shows us that a change of status was possible. The number of colonies during Kültepe's lower town level Ib seems to be smaller, but this assumption is strongly biased by the unbalanced number of texts. According to the texts during the level II period (ca. 1970-1835 BC) 21 cities hosted a *kārum* and 17 a *wabartum* (Figs. 12 and 14). During the level Ib period (ca. 1835-17th c. BC) there were 17 kārus and only 3 *wabartus* (Figs. 13 and 14).

The Assyrian colonial system was hierarchical with *kārum* Kaneš as its main administrative centre and a sort of extension of the city of Aššur (Larsen 1976, 247; (Veenhof and Eidem 2008, 181). A few letters addressed from and to Kaneš show that this city gave orders and instructions to the other *kārus*. Its authority concerned political, economic, juridical and administrative matters. In fact, the other colonies appealed to Kaneš for help and instructions about both what political and economic decisions to take. In addition, Kaneš had contacts with the mother city of Aššur, whose orders, demands and verdicts were transmitted to the other colonies belonging to the Assyrian trade network. An important aspect of the Old Assyrian trade is that reconstructing the economic system established by the Assyrians by just analysing the texts from Kaneš is dangerous, because they may offer only a partial and biased view. Although it is very difficult to trace the spread and the boundaries of the Assyrian trade system given the available data, textual evidence seems to suggest that Cilicia laid outside the Assyrian orbit. Most likely, in the Middle Bronze Age there were different trade circuits, which competed for control of specific products over well-defined regions and districts.

A letter from Kültepe's level II refers to the arrival of a group of Ebla's merchants to the palace of an Anatolian ruler in order to purchase copper (Veenhof 1988, 260). The archaeological excavations in the site of Kültepe have just yielded the private houses of Assyrian and Anatolian merchants, but we do not know if there was also a colony founded by traders coming from some Syrian kingdoms. In fact, the ancient Šubat-Enlil/Šehna hosted the *kārus* of Aššur and Sippar, but also merchant offices of local

[12] For a complete list of *kārus* and *wabartus* in the Kültepe level II and level Ib periods see Veenhof and Eidem 2008, 154-155; Barjamovic 2011a, 411.

Khabur city-states such as Kahat, Shuna and Amursakkum (Eidem 2008, 34-35). Texts contemporary with the level Ib of Kültepe's lower town show that several Syrian cities traded in Central Anatolia in competition with the Assyrian merchants.

Therefore, although the evidence at first seems to indicate an Assyrian monopoly of the trade in Central Anatolia during the Kültepe's lower town level II period (ca. 1970 – 1835 BC), it is difficult to conclude so. We can merely conclude that the Assyrians established a socio-economic system that was in competition with others, whose spheres of influence and boundaries were inevitably linked at various stages to the political situation in Upper Mesopotamia and Anatolia during the Middle Bronze Age. In this complex interface of suppliers and consumers, people sought to develop social mechanisms and political institutions that could operate over long distances to guarantee the constant flow of goods. Aššur, due to its geographical position, played an important role as an intermediary linking various other much larger areas of production and consumption.

3.5.3. Geographical reconstruction of trade

Reconstructing the spatial distribution of Assyrian commercial agencies in Upper Mesopotamia and Central Anatolia is a fundamental starting point for detecting specific geographical patterns. In the past, different geographical models, mainly based on the study and analysis of known written sources, have been proposed about the political and economic landscapes in the Old Assyrian colony period (cf. Forlanini 2008; Michel 2008; Veenhof and Eidem 2008; Barjamovic 2011a). Despite the large amount of written and archaeological data analysed, only four ancient toponyms of settlements hosting Assyrian commercial colonies have been certainly identified with archaeological sites: Amkuwa (Alişar Höyük), Hattuša (Boğazköy), Kaneš (Kültepe at Kayseri), and Šubat-Enlil/Šehna (Tell Leilan) (see discussions in Forlanini 2008, 75-80; Michel 2008; Veenhof and Eidem 2008, 153-167; Barjamovic 2011a, 107-122, 230-240, 280-282, 292-295, 312-313, 411). For the ancient site of Apum the identification is more controversial. Perhaps we have two Apum: one contemporary with Kültepe's lower town level II (*ca.*1970-1835 BC) and one contemporary with Kültepe's lower town level Ib (*ca.* 1835-17th c. BC). It is problematic identifying Tell Leilan with the Apum of the 20th-19th century BC because it was not occupied during the Leilan Period

IIc (*ca.* 2200-1900 BC). The Apum quoted in the texts discovered in the level II of Kültepe's lower town may be identified with Tell Aid or Tell Muhammad Diyab (Eidem 2008, 32-33; Veenhof and Eidem 2008, 271). Probably Apum was destroyed by Šamši-Adad I, but its name remained as a designation for the region (Land of Apum). Tell Leilan has been certainly identified with Šubat-Enlil/Šehna, which functioned as the capital of "the land of Apum during Kültepe's lower town level Ib" (ca. 1835-17th c. BC; Eidem 2008, 32). According to the texts from Mari the original name of the city was Šehna, and this name is also attested several times in the Old Akkadian texts found at Tell Brak. In addition, Šehna is attested in the year formula for the 23rd reign year (ca. 1728 BC) of the Babylonian king Samsu-Iluna, which records the destruction of Šehna, the capital of the land of Apum. Apart from the six fixed points listed above, most ancient toponyms have not been identified with certainty. In some cases the scholars have proposed fairly certain identification, while in other cases they have just roughly suggested areas of possible locations of ancient Anatolian toponyms. The identification of many ancient settlements have been accordingly proposed and accepted by scholars, but a certain disagreement lies around the identification of some toponyms: Durhumit, Ninašša, Purušhaddum, Tišmurna, Ulama, Wahšušana, Wašhaniya and Zalpa (south). The ancient city of Durhumit, mainly based upon evidence from Hittite sources, has been roughly located at Suluova, in the plain of Merzifon (Barjamovic 2008; Michel 2008, 241-242; Barjamovic 2011a, 244-250), or to the north-east of Tuz Gölü (Forlanini 2008, 68-72). Ninašša has been located on the western bank of the Kızılırmak River, around Harmandalı or Varavan (Michel 2008, 244; Barjamovic, 2011, 327-340), or to the south-east of the modern city of Hacıbektaş (Forlanini 2008; Veenhof and Eidem 2008). The identification of Purušhaddum with Acemhöyük has been widely accepted by scholars (Forlanini 2008, 65-66; Veenhof 2008b). On the other hand, Barjamovic (2008, 95; 2011, 362-366) opposes the traditional view of the historical geography of Anatolia and locates Purušhaddum around Bolvadin, much further to the west that one had previously thought. In addition, he identifies the ancient toponym Ulama with Acemhöyük (2011, 335-337). The location of Tišmurna is still unclear and Barjamovic locates it around Çorum (2011, 279), while Veenhof locates it somewhere to the north of Kaneš, along the northern bank of the Kızılırmak River (Veenhof and Eidem 2008). The toponym Wahšušana has been commonly identified with Köprüköy or Büklükkale, to the south of Ankara (Forlanini 2008, 63-64; Michel 2008, 244; Barjamovic 2011a, 339-345), while Veenhof locates it to the northern side of the Toz Gölü, around Harmandalı or Varavan (Veenhof and Eidem 2008). Also the location of Wašhaniya is problematic because on one side Barjamovic locates it around Kirşehir, inside the bend of the Kızılırmak River (2011, 323), and on the other side Forlanini locates it to the nort-east of Aksaray, on the southern bank of the Kızılırmak River (2008, 63). The location of Zalpa (south) has represented great difficulties for scholars because only gradually has become clear that four similar toponomies occurred in the sources (Forlanini 2004b). The Zalpa hosting an Assyrian commercial colony has been located around Samsat Höyük (Forlanini 2008, 75; Barjamovic 2011a, 107-108). As we have shown above we have only six fixed points as nodes of the trade network set out by the Assyrian in Upper Mesopotamia and Central Anatolia in the Middle Bronze Age (see Fig. 14). This may represent both a good start point for possible future works and a problem for the research lines to follow. Another obstacle is the uncertain and debated location of some toponyms such as Wašhušana, Šalatuwar and Purušhaddum, important commercial nodes of the western circuit of the trade system. At this point, the actual state of knowledge and the fragmented status of available data (textual and archaeological) make it impossible to choose between one or another of the geographical reconstructions that follow (basically the model of Barjamovic vs. Forlanini). Therefore, in the present dissertation, I will make use of sensitive analyses where the different results produced will be evaluated step by step according to the models chosen between those proposed in the past or one newly built.

3.5.4 Goods and production

The Old Assyrian trade was mainly based upon two commodities: tin and textiles, which were carried by donkey caravans equipped at Aššur to Anatolia, where they were sold in exchange for silver and gold. Tin, most likely, was brought either directly or indirectly to Aššur from Iran and Afghanistan via Susa (Dercksen 2005, 19; Veenhof and Eidem 2008, 82-83),[13] while the textiles were both produced locally in Aššur and

[13] Tin was exported and shipped to Anatolia as ingots that had the shape of a slab or plaque. Veenhof has calculated, by analysing the available texts, that about 13.5 tons of tin were exported to Anatolia over a period of 40-50 years (Veenhof 1972, 79-80), but this total was calculated on the basis of evidence from just ten private archives then available, and the full amount may be ten to one hundred times higher (Barjamovic 2011a, 11).

imported from important production centres further south such as Sippar and Babylon (Larsen 1976, 89; Dercksen 2000, 138; Fig. 16).[14] The Assyrian merchants did not bring back any subsistence goods or essential raw materials from Anatolia to Aššur because the main target of the trade was easily portable and convertible wealth in the form of gold and silver. While Anatolian gold could not circulate commercially because there was an Assyrian legal prohibition against selling and exchanging it in Mesopotamia, silver was universally accepted as means of payment in the whole Mesopotamian trade (Veenhof 1997, 339-340).

In Aššur, silver was used for promoting new commercial enterprises (the equipment of a new caravan, the merchandise to be exported to Anatolia, the donkeys, the hire of personnel, etc.), and for the purchase of other necessities of the life (such as houses, barley and wool). The different economic conditions prevailing in Anatolia were characterized by different supply and demand and by different rates of exchange that allowed Assyrian merchants to get cheap silver, which then could be invested for further deals. In fact, in Anatolia, tin cost at least twice as much as in Aššur (in Aššur one could buy 14 shekels of tin with one shekel of silver, while in Anatolia 7 shekels of tin could be sold for one shekel of silver), while the various qualities of textile could yield triple their purchase price (10-25 shekels of silver against 3-7 shekels of silver; see Dercksen 2004a). Therefore, the Assyrians established a trade network based neither on the procurement of subsistence goods nor on the export of native goods, but "on purely commercial exchange resulting in "profit" by acquiring much more silver than originally invested" (Veenhof 1997, 340). The whole trade was a private enterprise carried out by several family firms in which other citizens (including the rulers of the city of Aššur) and the temples invested. Nevertheless, this long-distance socio-economic arrangement was made possible in Upper Mesopotamia and Anatolia thanks to the support and the official commitment of all political and public institutions of Aššur. In addition, the Assyrians not only imported textiles and tin to Anatolia, but also were able to get the control of the internal market of wool and copper in Central

[14] The amount of textiles from Aššur to Anatolia calculated by Veenhof over a period of 30 years is equal to 14,500 (Veenhof 1972, 79-80), but again this was on the basis of just ten archives, and the actual number was perhaps higher (ca. 150,000), implying that about 3,000 textiles a year were exported to Anatolia (Barjamovic 2011a,12).

Anatolia (see Lassen 2010). They sold part of what they exported (tin and textiles) in exchange for cheap copper (where it was locally available), which then was sold throughout central Anatolia for silver and gold, the main goals of the Assyrian trade (Lassen 2010, 170-171). The clients interested in the trade of wool and copper were the rulers of the Anatolian city-states, the native merchants that could sell the copper throughout Anatolia, the metalsmiths and the city elites. Thus, the Assyrian merchants played an important role as mediators among the various Anatolian kingdoms (see Dercksen 1996).

3.5.5 Logistics and trade routes

The route from Aššur to the city-states in Anatolia covered a distance of about 1,000 km through a landscape characterized by rocky mountains, intermountain valleys, deserts and plains, and it perhaps took from five to seven weeks to complete the trip. Before leaving from Aššur, merchants had to equip their caravans, hire personnel and organize everything in order to guarantee a safe long journey. In fact, this long-distance trade was possible only by using donkeys as pack-animals. Perhaps a donkey caravan approximately covered 25 km a day (Dercksen 2004, 255). The caravans were led by one or more *kaṣṣarum,* who usually were recruited among the young members of a family firm of Assyrian traders (Barjamovic 2011a, 17). The *kaṣṣarum* had to take care of all administrative duties related to the trip, to supervise the goods traded and to guarantee that everything arrived safely at destination. The leader of the caravan was accompanied by one or more *saridum*, who acted as donkey-drivers or packers and was hired for just a tract of the whole journey (e.g. from Aššur to the Euphrates or from the Euphrates to Kaneš). The number of *kassarum* or *saridum* is often one for each donkey, but sometimes is one for two animals. A caravan of 300 men and 300 donkeys mentioned in a written source supports this interpretation. Nevertheless, among the 300 men there were a lot of donkey-drivers and just a small portion of them were actual merchants (Dercksen 2004, 284). The goods were transported by means of donkeys and there is no evidence that horses or mules were used as pack animals during the Old Assyrian Colony period. Each donkey, during the trip from Aššur to central Anatolia, could carry a load weighing 65 kg, and quite often letters and accounts reveal that some donkeys died along the road towards Kaneš (see Dercksen 2004; Stratford 2014). When the Assyrian merchants reached this city, they sold their donkeys because the animals were worth a considerable amount of money and many were unnecessary for the return trip, when the loads were lighter. The Assyrian texts show that an important role in the trade was played by the *rādium*, a guide hired by the merchants for crossing the rivers or for leading the caravans in unknown areas (Barjamovic 2011a, 18). It was necessary for the caravans' leaders to be familiar with the itinerary to be undertaken, because in such a long-distance trade, it was important to know the distribution of stopping places over the region to be crossed. Many such stopping places were distributed in Syria and Anatolia along the routes most trafficked and used by the Assyrian traders. In fact, such stopping places often offered not only accommodation, protection and food, but also played a crucial role in the development of the whole trade network. A few texts indicate that these 'inns' were used to feed donkeys and to store large amount of goods safely (see Barjamovic 2011a, 34-37). Other important features in the infrastructure of the trade were roads, bridges, ferries and fords. In this case, see chapters 6 for a broad overview about them.

3.6 Summary

This chapter has provided a chronological and spatial context that will prove useful when I subsequently develop models and analytical techniques to understand the political and commercial landscapes in Upper Mesopotamia and Anatolia in the early second millennium BC. The level of sophistication and detail in the background textual information provided here is justified by the need to define, from the beginning, important key points that will be more deeply addressed in the following chapters. The chapters that follow will, first, revisit the political and economic situation as suggested by written sources in the different light of the available archaeological data on Middle Bronze settlement (Chapter 4). This will involve analyses designed to investigate past settlement hierarchies and dynamics of competition and political dominance (chapter 5). Second, the spatial structure of the Old Assyrian trade system and its organization will be used as starting point to reconstruct landscapes of interaction and movement on both local and interregional scale (Chapter 6). Finally, a tentative attempt is made to blend all known archaeological and textual evidence in chapter 7.

Chapter 4

Perspectives on Material Culture: Intra and Inter-Regional Dynamics

4.1 Introduction

This chapter investigates and offers explanations for the distribution of material culture in Upper Mesopotamia and Central Anatolia during the Middle Bronze Age. Four types of material culture -- as Syrian bottles, Khabur Ware, pan balance weights and seals -- will be analysed. This choice of object types can be justified by the fact that these have been proposed as possible tracers of long-distance trade between different political and cultural entities in northern Syria, northern Mesopotamia and Anatolia, and have a good chance of having been identified in excavated assemblages. By using published and unpublished data and adopting a quantitative spatial approach, I will (a) consider diachronically the distribution of these artefacts in Upper Mesopotamia and central Anatolia during the early 2nd millennium (ca. 2000-1700 BC), (b) assess the relationship between specific typologies and different archaeological contexts and (c) address whether or not the spatial distribution of these objects can be related to the Old Assyrian or other trade circuits.

As previously mentioned in chapter 2, inter-regional interaction in the ancient Near East has provided a stage for rival theoretical frameworks and academic narratives. In particular, the wide variety of natural resources in certain areas and deficiencies suffered by other regions (e.g. in certain raw materials such as stone, wood and metals) has played a fundamental role in the economies of early eastern Mediterranean and Middle Eastern complex-societies. It has also promoted, from the eighth millennium BC onwards, different strategies such as trade, gift exchange, colonization, raiding or military conquest to get control and access to the resources of neighbouring or remote regions (c.f. Lamberg-Karlowsky 1972; Wallerstein 1974; Oded 1992; Algaze 1993; Rothman 2001; Stein 2005).

In Central Anatolia and Mesopotamia in the early second millennium there were several different commercial systems that, put perhaps slightly blandly, “consisted of a series of interlocking circuits feeding each other and overlapping at certain nodal points” (see Larsen 1987, 53). The study of the retrieved textual evidence (e.g. Mari and Kaneš’ archives) suggests that those commercial circuits were rigid and exclusive as evidenced by attempts by states and other actors to monopolise certain trades and excluding competition (see discussion in Barjamovic 2011a, 8-9). For example, the Assyrians, in a treaty with an Anatolian ruler, ask the latter not to trade with Akkadians (c. f. Sever 1990, 261ff; Çeçer and Hecker 1995, 31-41; Veenhof 1995b, 1733ff; Barjamovic 2011a, 8). That this is true does not exclude some overlapping movement by merchants and envoys from other trade networks and political entities. Particularly, in the early Middle Bronze Age, cities such as Aššur, Kaneš, Aleppo, Ebla, Mari, Ugarit and Sippar owed their prosperity to the trade of metals (e.g. tin, copper and silver), textiles and some fine agricultural goods such as oil and aromatics (c.f. Roualt 1977; Bonechi 1992, 11-13; Dalley 2002; Dercksen 2005; Veenhof and Eidem 2008, 82-95).

With these concerns in mind, I will now briefly consider how objects can move from one place to another and how we may recognise those processes archaeologically. Over the past 20-30 years, diffusionist models and mass-migration theories have lost ground for explaining distribution and changes in material culture (Lloyd 1956; Mellaart 1963, 1981; Yakar 1981; Gülçur 1995; Bilgi 2001). More comprehensively, Bevan (2007) identifies four different scenarios that characterise the movement of objects: 1) objects travel with their owners under some sort of duress (e.g. possession of slaves, captives, and refugees); 2) objects travel with their owners in a more voluntary way (e.g. possession of merchants, envoys, administrators, mercenaries, etc.); 3) forced exchanges between people (e.g. tributes, plunders, robbery); 4) voluntary exchanges between people (e.g. gifts, commercial trade, marriage alliances, etc.). Via this perspective, I will examine all possible interplays between social forces that could have contributed to the spread of the four types of material culture mentioned above.

As noted in chapter 2, another crucial problem is represented by the difficulties in comparative scale in the archaeological record with regard to three broad categories of material: organics, metals and pottery. In fact, the existence of commercial relations, whether on a small or large scale, are not easy to detect if perishable commodities such as textiles, perfumes, oils, wines, spices and woods do not always leave discernible traces. For the organic materials we have almost no quantifiable archaeological data and the only surviving evidence comes from textual records (see Veenhof 1972, 79-80; Archi 1984; Lassen 2010 and 2013; Barjamovic 2011a, 12). Metals were an important target of long-distance trade in the Middle Bronze Age, but they represent a problematic record because they were extensively recycled and recast and only chance finds of deposits and caches provide us with tiny clues about what their original magnitude (cf. Veenhof 1972, 79-80; Sherratt and Sherratt 2001; Dercksen 2005).

In contrast, pottery is one of the most tangible products of human activity and its durability through the time and ubiquity throughout much of the world makes it a privileged tool for the study of the past (Arnold 1985, 1). Ceramic styles are generally assumed to reflect social relationships between groups of people living in villages, towns and cities at largely the same time or in largely the same place (Egloff 1972, 148). This assumption reflects several others: first, that pottery can reflect the culture and the ethnicity of a specific group (Grieder 1975, 850-1). Postulating the correlation of artefacts with ethnic groups is common practice in archaeology, although such hypothetical correlations are often difficult to test and/or to confirm (Shennan 1989, 15). Rather, pottery reflects only one aspect of wider archaeologically recoverable material culture (Hamlin 1971, 13) and the result of a human activity involving a range of technological, economic, social and ideological priorities (Rappaport 1971, 66-65; Arnold 1985, 16). Another assumption commonly made in archaeology is that the similarities in artefact styles are the result of cultural contact and diffusion between groups of people (MacNeish *et al.* 1970), while differences in typology, technique, shape and decoration denote a lack of such cultural interaction. Even though pottery is a valuable indicator in the archaeological record, there is the tendency to overestimate its role and underestimate other less visible items of trade, which hardly leaves discernible trace of goods that at times were more valuable than their pottery containers (Renfrew 1969, 163; Sherratt 1999).

In a work that deals with the distribution of specific kinds of material culture, it would be ideal to specify the exact origin (i.e. the provenance) of the object involved. Nowadays, the reconstruction of exchange systems and their development has been enhanced by sophisticated techniques for studying the provenance of material (e.g. chemical analysis of trace elements in the objects themselves, lead isotopes, neutron activation, atomic absorption, etc.). Nevertheless, very little has been done in this direction for Upper Mesopotamia and central Anatolia and very few petrographic ceramic analyses (e. g. Day et al. 2008; Bong et al. 2010) and lead isotope analyses (e.g. Begemann *et al.* 1992 and 1995; Lehner et al. 2009 and Lehner 2012) have been performed. A very few studies have been carried out in the analysis of obsidian (Carter *et al.* 2006 and 2008; Frahm 2012; Frahm and Feinberg 2013) and of iron oxides (Imberti *et al.* 2008; de Vries-Melein et al. 2010). Given these constraints, the provenance and diachronic distribution of objects will be assessed on the basis of their typology, chronology and local frequency of finds. In the case of raw materials such as iron oxides their original location can be hypothesised on the base of known deposits that may have been used in the Middle Bronze Age.

4.1.1 Research Questions

This chapter, by using published data framed into a quantitative and spatial approach, aims to assess the diachronic distribution of four different specific examples of material culture (Syrian Bottles, Khabur Ware, balance pan weights, and seals) in Upper Mesopotamia and central Anatolia in the early 2nd millennium (ca. 2000– 1700 BC). It will be split into four parts, with each part offering an overview of each material culture type, and it will aim to develop the following four points:

- What is the diachronic distribution of the above key object classes and are there distinctions in each category of item between the types most commonly used in different regions? Are there chronological differences in the adoption of specific types in different regions?

- Are there any consistent associations between specific artefact types and specific kinds of intra-site archaeological context? If so, are these consistent or variable from region to region?
- Is there any reason to suggest that specific political and economic factors, as well as certain type of exchanges (e.g. trade, gift, tribute, plunder), were responsible for the distributions of material culture and goods we observe?
- How are specific technologies and administrative practices (e.g. metrology and sealing) related to the movement of goods and how were they spatially transferred and transmitted?

4.1.2 Methodology

I have collected data from all excavated sites in Upper Mesopotamia and central Anatolia with a known occupation between 2000 and 1700 BC, recording the on-site occurrence of four types of material culture (Khabur Ware, Syrian Bottles, balance pan weights and seals), their temporal position within the local stratigraphy and any regional chrono-typology. On the basis of published archaeological excavation reports, I have also recorded the kind of archaeological context in which any item was found (domestic/public buildings, palaces, temples, cultural areas, graves, etc.) and, where possible, any observable attributes (e.g. shapes, decoration motifs, styles, sizes, weight, etc.) in order to detect specific spatial and functional patterns at a local and regional scale. In the case of Khabur Ware, I have also made use of unpublished material coming from the British Museum and UCL Institute of Archaeology's collections.

4.2 Syrian Bottles

4.2.1 General characteristics and definition of shapes

Syrian Bottles are small to medium size ovoid or globular vessels (between 23 to 6 cm in height and 12 to 4 cm in width) with a small narrow neck and flaring rim (see Figs. 17 and 18: 1a-c). We may roughly estimate that the biggest bottles could contain approx.

800-1000 ml, while the smallest ones could contain approx. 80-100 ml. During the Middle Bronze Age Syrian bottles differentiated from the third millennium alabastron type bottles by longer necks, wider shoulders and the presence of ring bases (see Kontani 2010, 53). Kutlu Emre, with regard to the proportions between height and width, identifies four different sub-typologies for the early second millennium's Syrian Bottle (1999, 39-41): 1) Ovoid-egg shape (Fig. 18:1a-c); 2) Globular shape (Fig. 18:2a-b); 3) Cylindrical shape (Fig. 18:3a-b); 4) Piriform shape (Fig. 18:4a). The Syrian bottles are made of black to dark grey paste and burnished in the same colour, and have a surface decorated with shallow horizontal incisions.

Unfortunately, we do not know with certainty what these bottles contained; but from their size it has been plausibly suggested that they were designed for containing perfumed oils or unguents used for anointing the dead in funerary contexts (Goldman 1956, 302; Mellink 1989, 323; Zimmermann 2005, 164). The presence of rhomboidal "net bag" designs, visible as shallow relief decoration on the surface of some bottles retrieved in Early Bronze Age occupation levels at Kültepe (Fig. 19:1-2), provide a further clue about how these vessels may have been wrapped and carried, leading Zimmermann (2005, 164; 2006) to propose that Syrian Bottles transported their content over long-distances. Ebla's archives record that olive oil circulated regionally in a network of long-distance trade in the third millennium BC (Pettinato 1981, 162; Archi 1991), and more broadly the long-distance trade in oil can be related to the transport of distinctive regional liquid commodities by different communities acquiring a taste for exotic oils that may also have been used for cosmetic purposes (Bachuber 2012, 58).

4.2.2 Limits of the dataset

This type of object has a long chronological life, from the first half of the third millennium to the second half of the second millennium BC, and thus is not suitable as chronological marker. Syrian bottles, despite their long life, exhibit a fairly narrow spatial distribution during the Middle Bronze Age, especially when compared to the more widespread distribution of the same kinds of objects in the preceding Early Bronze Age. In Upper Mesopotamia and Central Anatolia, just 16 sites with occupation documented for the period 2000-1700 BC have yielded 103 Syrian bottles. Unfortunately, the site with the highest number (38), is Tell Atchana-Alalakh, where Woolley's excavation report (1955) fails to specify the original context of 29 bottles and the stratigraphic level of 16 may well belong to the Late Bronze Age. In addition, often little or no information is provided about the size of Syrian Bottles in different excavations, which makes it difficult to conduct any sort of quantitative study into the volumes of those bottles. There has also been no provenance analysis on the paste of this fine ware.

4.2.3 Diachronic and spatial distribution

Syrian bottles were originally produced in Northern Syria/Mesopotamia and then spread from the middle of third millennium BC onwards into central and western Anatolia and as far as the Aegean Sea as imports or local imitations (see Zimmermann 2005, 161; Rahmstorf 2006a, 55; Fig. 20). In Upper Mesopotamia and Anatolia, 62 sites have yielded Syrian bottles dated to the Early Bronze Age (for the spatial distribution of Syrian bottles in the Early Bronze Age see Rahmstorf 2006a, Fig. 6). Thanks to the different fabric characteristics it has been possible to understand that in the third millennium BC the furthest northern and north-western examples from Anatolia (e.g. Troy, Demircihüyük-Sarıket, Küçükhöyük, and Küllüoba) were local productions rather than imports (Schachner and Schachner 1995, 88; Zimmermann 2005, 163-164; Rahmstorf 2006a, 56). Instead, the westernmost areas where "real" imports spread were central and south-central Anatolia (e.g. Acemhöyük, Kültepe, Alişar Höyük and Karahöyük in Konya; Schachner and Schachner 1995, 91; Kontani 2010).

Unlike the Early Bronze Age, in the early second millennium (ca. 2000 – 1700 BC) just 16 sites have yielded Syrian bottles and the spatial distribution of this type of vessel was confined mainly in northern Syria and south-eastern Anatolia (see Figs. 21 and 22). Kültepe is the westernmost and only central Anatolian site in which Syrian bottles have been found (see Emre 1999), with this site yielding one bottle from a cist grave belonging to the lower town's level Ib (ca. 1835-17th c. BC) and five bottles from level Ia graves (ca. 17th c. BC). Only four northern Mesopotamian sites out of fifteen have yielded vessels dated to the Middle Bronze Age I (ca. 2000-1800 BC): Tilbeshar Höyük

(1 bottle from area D, level IV A; Kepinski 2005, 150); Tell Mardikh (8 bottles from Favissae F. 5238 and F. 5327; Marchetti and Nigro 1997, 10-11), Tell Shiyukh Tahtani (2 bottles from tombs T. 119 and T. 120, phase 8; Falsone and Sconzo 2010, 6-7), and Lidar Höyük (3 bottles from phase 3/2 and phase 2; Kaschau 1999, 259,262,265).

4.2.4 Intra-site contexts

Among the Syrian bottles recorded for the early second millennium (ca. 2000 – 1700 BC), 36 (34.95 %) out of 103 come from unknown or not well defined contexts, 40 (38.85 %) from funerary contexts, 15 (14.56) from domestic contexts, 9 (8.73 %) from cultic deposits related with the worship of a goddess and 3 (2.91 %) from palace contexts (Fig. 23).

From the level VII of Tell Atchana's palace three bottles were respectively found in room 2 (Heinz 1992, pl. 12: 49), in room 19 (Heinz 1992, pl. 12:47) and from a poorly-defined open area adjacent to the palace (Heinz 1992, pl. 12: 48; see Fig. 24). The site of Lidar Höyük has yielded fifteen Syrian bottles from two domestic quarters respectively located on the northern and southern slopes of the main mound and dated to the Middle Bronze Age I and II (see Kaschau 1999, 231-268). Instead, other sites such as Tell Hariri (one example from chantier A; Lebeau 198, Fig. 3:4) Kurban Höyük (4 examples from area D; Algaze 1990, pl. 104: a-b, pl. 133: h-i), Tilbeshar Höyük (1 example from area D, Kepinski 2005, Fig. 6: 1), and Tell Atchana (29 examples; Woolley 1955, 330) have yielded bottles from poorly-defined areas providing no clues about their original functions. At Tell Mardikh (Ebla), eight Syrian bottles are dated to the Middle Bronze I and II from two wells/cisterns (Favissae F.5327 and F.5238, Marchetti and Nigro 1997) located to the east of the monument P 3 and to the south of the temple P2 in the Area P devoted to the cult of Ištar (Fig. 25). These two cisterns were about 10 meters deep and yielded hundreds of objects and ceramic vessels. It has been proposed that they were votive wells in which vessels containing food or precious liquids were thrown as offerings related to the cult of the goddess Ištar (Marchetti and Nigro 1997, 9, 22-23).

Among the funerary contexts particularly relevant are the findings at Tell Mardikh of a Syrian bottle from the layer IIIB1 (ca. 1800-1700 BC) in the royal tomb of the Lord of the Goats (Nigro 2002, pl. LVI: 92) discovered underneath the Western Palace and accessible through a vertical shaft, and at Hama of two bottles in a two-chambers tomb (G I A-B) yielding also valuable items such as a gold plate, a silver bead, bronze axes, beads and a pin. Another tomb yielding a Syrian Bottle and that may reflect the wealth and the high social status of the person buried is the cist grave M.9 from Kültepe's lower town level Ib. This grave is one of the largest ever discovered in the lower town and, despite a partial robbery, has yielded two gold ring-shaped objects, a gold pin with lobed head of lapis-lazuli and a gold pin with pierced shank (Emre 1999, 42). To sum up, in the early second millennium BC, the Syrian bottles come mainly from funerary contexts and just a few examples come from other types of context. Particularly, only Kurban Höyük and Tilbeshar Höyük have not yielded Syrian bottles coming from funerary contexts, although that could be also due to the under-representation of funerary contexts in the Middle Bronze Age levels from those two sites.

4.2.5 Discussion

Syrian Bottles are wheel-made, well-fired, thin-walled, decorated containers whose geographical distribution indicates the existence of inter-regional contacts between Central Anatolia and Upper Mesopotamia. They were perhaps used for transporting over long-distance highly demanded trade goods such as fine perfumed oils and unguents (Mellink 1989, 323; Zimmerman 2005, 163-164). The striking difference in the distributions of this type of ceramic shape between those two periods raises legitimate questions. Why did the evidence of Syrian bottles decrease in the Middle Bronze Age in comparison with the third millennium BC? Is this phenomenon related to a changed political and economic situation in Upper Mesopotamia and Anatolia? What is noteworthy is that the evidence for Syrian bottles has strongly decreased in Central Anatolia between the third and the second millennium BC. In particular, if in the Early Bronze Age Kültepe yielded several bottles from the main mound's levels 12-17 (Özgüç 1986a, 34-37), in the early second millennium the same site has yielded six examples, with only one from the archaeological level (lower town's level Ib, ca. 1835-

17th c. BC) contemporary to the Old Assyrian commercial colony period. This aspect could suggest that the Assyrians may have excluded from the trade system occurring in Upper Mesopotamia and central Anatolia foreign merchants and their own goods. In fact, Syrian bottles and their contents were originally manufactured in northern Syria and probably not traded by Assyrians merchants. Hence, it seems legitimate to speculate that the trade in this kind of fine ware was related to a circuit associated with the city-states of Mari, Emar and Aleppo that may have held commercial control in the area to the west of the Euphrates. More simply, a further explanation could be that Syrian bottles or their contents were no longer a highly demanded good in Central Anatolia in the 2nd millennium because either fine oil started being carried in a different kind of container or a change of fashion had occurred, perhaps as witnessed by the lack of evidence for local imitations in this region either.

A contextual analysis has revealed that Syrian Bottles were mainly related to the funerary sphere, as containers for perfumed oils and unguents used for the anointment of dead (Bachuber 2012, 506; Zimmermann 2005, 164). In addition, it seems that those vessels are related with a high social status individuals as suggested by the finding in the royal tomb of the Lord of the Goats at Ebla, the two chambers-tomb at Hama, the cist grave M9 and other burials at Kültepe, and the Palace of Alalakh. The possible use of Syrian bottles at Tell Mardikh (Ebla) as container of votive offerings devoted to the cult of the Goddess Ištar could corroborate the idea that those vessels contained precious liquids for use in ritual activities.

4.3. Khabur Ware

4.3.1 General characteristics of Khabur Ware

4.3.1.1 Origins

Khabur ware is a wheel-made painted pottery mainly distributed in the Khabur Triangle approximately from the beginning to the middle of the second millennium BC (ca. 2000 -1400 BC; Mallowan 1937, 10; Curtis 1982, 79-85; Oguchi 1997b and 2006; Palmisano 2012). However, the recent archaeological excavations carried out between 1998 and 2001 by the Deutsche-Orient-Gesellschaft (DOI) under the direction of

Pfälzner in the phase C7 of the domestic quarter C2 at Tell Mozan have revealed that the first appearance of Khabur Ware could start a little earlier, with a few examples (less than 0.5 percent of the whole pottery assemblage) found on the floors of the phase C7 of the Phusam's house dated to the Early Jazira V period (ca. 2100-2000 BC; see Pfälzner 2012, 58; Schmidt 2012, 163-165). [15]

Apart from Tell Mozan, the earliest evidence of Khabur Ware has been dated between ca. 1900 and 1800 BC and has been found at ten other archaeological sites located in northern Iraq, Syria and north-western Iran: Tell al-Rimah, Tell Billa, Tell Taya, Tell Jigan, Tell Barri, Tell Mohammed Diyab, Tell Brak, Chagar Bazar, Hasanlu and Dinkha Tepe (cf. Hamlin 1971, 307-14; Hamlin 1974; Oguchi 1997b, 196-206; Faivre and Nicolle 2007, 182-183). This evidence may tell us about the original production centres of Khabur Ware in the early second millennium BC, but it does not reveal the wider context and stylistic precursors to this pottery. At present, four different theories have been proposed concerning the origin of the Khabur Ware, with respective emphasis on eastern, western, northern or indigenous origins (see Fig. 26). According to some commentators, Khabur Ware could be regarded as a northern Mesopotamian variant of the ceramics coming from the Iranian highlands (Young 1969, 290; Dyson 1973, 708-711; Fig. 27). On the other hand, Hamlin stated critically that the possibility of the eastern origin should be discarded (1974, 142-145). Other researchers say the Iranian materials are influenced by Khabur Ware (Özfirat 2002). Some scholars have also evoked the possible western influences of ceramic groups from the Levant and Cilicia around the end of the 3rd millennium and the beginning of the 2nd millennium (Welker 1948, 205; Seton Williams 1954; Porada 1965, 172; Amiran 1969, 113-118; Figs. 28 and 29). In contrast, a possible northern origin for the Khabur Ware has also been proposed on the basis of its affinities with band painted pottery in the Malatya-Elaziğ region (Marro 1997, 201-202; Fig. 30). Finally, those scholars proposing an indigenous origin in Upper Mesopotamia consider the 3rd millennium band-painted pottery found along the Middle Euphrates as ancestral to later Khabur Ware (Hamlin 1971, 313; Burney 1977, 137; Stein 1984; Fig. 31).

[15] Pfälzner prefers to say that the phase 7 of the area C2 does not perfectly match with the Eealy Jazirah V period but that it could last slightly longer (e.g. 2100-1950 BC).

4.3.1.2 Classification and vessels shapes description

For the purposes of this chapter, Khabur Ware can be divided into four main shape categories: 1) jars; 2) beakers, cups or goblets, 3) bowls and 4) grain measures.[16] Although the latter shape seems like a very precise attribution, the present classification exists mainly for descriptive purposes as it remains very difficult to discern the real function of each shape. One problem affecting the reliability of the present database is the large amount of vaguely known but poorly published data. First, I will describe each of the four categories quoted above.

1) The jars and pots are typically characterised by wide mouth (Fig. 32:1-2; Fig. 33:1-2); but there are some examples having narrow mouths in comparison with the vessel body size. The jars can have either tall or short necks (Fig. 32:3-6; Fig. 33:3-6; Fig. 35: a-b), rounded or carinated shoulders and a globular (Fig. 32:6; Fig. 33:7-8), ovoid or elliptical body. The pots are similar to the jars but lack a neck, again showing both open and closed shapes, carinated or rounded shoulders and semi-elliptical or globular bodies. However, in many cases it is difficult to discern if the vessel part below the rim is a neck or not.
2) The beaker/cup/goblet is a category, which is generally used for indicating drinking vessels (Fig. 34:5-8; Fig. 36: a-c). This shape is characterized by eversible-necked/rimmed shoulder cups, tall necked shoulder cups, open form goblets and straight/concave-sided beaker type painted vessels. They all have a wide mouth and tapered rims.
3) The bowl category consists of both more open and slightly more closed shapes. Among the open form vessels are the carinated bowls, characterized by flat, disc, ring, high ring bases and solid pedestals (Fig. 32:8; Fig. 34:1-3; Fig. 37:a). There are also open vessels with no carination such as small shouldered bowls with flat, disc and ring (pedestal) bases (Fig. 32:7; Fig. 34:4).
4) The “grain measure” category consists of a cylindrical straight/concave-sided vessel with low carination that could be painted, unpainted, incised, and ribbed (Fig. 34:9-11; Fig. 37: b). The term “grain measure” has been coined for the first

[16] For this last category I will keep Mallowan’s original definition, which is broadly known among scholars, in order to avoid introducing a new term that could be misleading.

time by Mallowan and examples of this ceramic typology have been found in many sites in Upper Mesopotamia (1946, 148).

4.3.1.3 Decoration

Khabur ware exhibits a monochrome painted decoration in red, brown or black, consisting mainly of geometric motifs that are usually located on the upper part of the vessel (although there are a few examples decorated on both the upper and lower parts, and a few vessels with naturalistic motifs). The painted decorative repertoire is summarised in Fig. 38. The most frequent iconographic motifs are the horizontal monochrome painted bands (Fig. 38:11-12), occurring commonly on jars, pots and bowls. Another frequent iconographic motif is represented by cross-hatched triangles (Fig. 38:8) framed by horizontal bands into a frieze decorated with dots (Fig. 38: 16), chessboard patterns (Fig. 38:15), etc. Linear triangles (Fig. 38:6-7) are often used instead of cross-hatched triangles or combined with them into a frieze found on jars, pots and some shouldered bowls. Painted decoration on Khabur ware is sometimes also combined with incised decoration (Oguchi 1997b, 48; Faivre and Nicolle 2007, 188), with wide incisions (grooving) and horizontal ridges forming raised or unraised bands (ribbing) and combined with painting on some jars, jars/pots and bowls. The combination of painted bands and combed incisions is a clear diagnostic for detecting examples belonging to the earliest phase of Khabur ware (Khabur ware 1 period, *ca.* 1900-1800 BC; see Oguchi 1997b, 53).

4.3.1.4 Periodization

Oguchi (1997b and 2006) has proposed four different chronological phases of this ceramic group on the basis of the evidence from the Khabur Triangle:

- Phase 1 (1900-1800 BC);
- Phase 2 (1800-1750/30 BC);
- Phase 3 (1750/30-1550 BC);
- Phase 4 (1550-1400 BC).

The establishment of the earliest phase, Khabur Ware I, is based on the evidence coming from Tell Taya (level IV), Tell al Rimah (area As, phase 3), Tell Jigan (area A, B and C) and Tell Billa in the tell ‘Afar region in northern Iraq. Other archaeological sites yielding vessels that may be dated to the first phase are Tell Hamad Agha es-Saghir, Mohammed Diyab, Tell Barri, Tell Brak, Chagar Bazar (level I), Tell Mozan (Area P), Hasanlu and Dinkha Tepe. Nevertheless, the data proposed for the beginning of the first phase cannot be longer accepted to the light of the find of Khabur Ware on the floors of the phase 7 of Puššam’s house (area C2) at Tell Mozan. More precisely, both the style and the orthography of more than 250 seal impressions and the palaeography of a cuneiform tablet found in the Puššam’s house provide clear and incontestable proofs for dating the building, and thus the phase C7, to the Early Jazira V period (ca. 2100-1950 BC) (cf. Pfälzner 2012, 55-56; Schmidt 2012, 163, 172-173). Therefore, what we can do it is to slightly date back to the late 21st century/early 20th century BC, the beginning of the first phase. The Khabur Ware of phase 1 is characterized by just two shapes such as jars and bowls with painted and unpainted decoration (see Fig. 39).

The dating of the Khabur Ware Period 2 is less problematic than the former phase because the vessels have been found in association with written sources in form of clay tablets or inscribed seal impressions on envelopes, tablets or sealing. Eight sites have yielded epigraphic evidence associated with the Khabur ware: Chagar Bazar, Tell Hariri (Mari), Kültepe, Tell al-Rimah, Tell Taya, Tell Leilan (Šubat-Enlil), Tell ‘Ashara (Terqa) and Tell Bi’a (Tuttul). The epigraphic evidence from Chagar Bazar, Tell Taya, Tell Leilan, Tell Bi’a and Tell al-Rimah, have allowed dating the beginning of the phase 2 during the kingdom of Šamši-Adad I (*ca.* 1800 BC*)*. In the Khabur Ware phase 2 new shapes of vessels were introduced such as cups/beakers and particular cylindrical vessels with a low carination, better known as “grain measures” (see Fig. 39). Among the jars in this phase there are two new sub-typologies such as short/long necked jars (Fig. 33: 3-6; Fig. 35: a-b) and globular jars (Fig. 33: 7-8) having as decoration hatched triangles and dots framed by horizontal painted bands.

4.3.2 The dataset and its limits

Khabur ware pottery dateable to the Middle Bronze Age (ca. 2000-1600 BC) was recorded in a database (for a complete description of the dataset see Palmisano 2012), including complete vessels and diagnostic sherds (n=2425). Any further undiagnostic sherds have simply been counted by site (n=149). In total, the database is composed of published/unpublished items (n = 2574). The published data come from the excavation reports of 51 archaeological sites, while a further 21 whole vessels (17 unpublished) come from the British Museum and the UCL Institute of Archaeology's collection (see Palmisano 2012 for further details). In addition, there are further sites whose excavators note the presence of Khabur Ware, but without further detail (see Fig. 42 for a list).

The site which has yielded the highest number of items (n=750) is Tell Mozan, which is the only one that has had a systematic study and publication of the pottery from the late third millennium-early second millennium BC phases (phases C7-C4 from area C2 dug by a German team, cf. Pfälzner 2012; Schmidt 2012 and 2013). Unfortunately, almost all the published Khabur Ware of Tell Mozan comes from the domestic quarter dug by the Germans. Hence, this provides us a very partial picture of the overall Khabur Ware's assemblage that have been likely found in other contexts and never published. Further limitation in the dataset is the uncertain periodization of some vessels/potsherds published in the archaeological excavation reports of sites investigated without stratigraphic methods in the early twentieth century. In addition, a considerable amount of data is still unpublished. In the end, just a very few archaeological reports provide the proportion of Khabur Ware in the overall pottery assemblage of a given site.

4.3.3. Diachronic and spatial distribution.

From the available data it is possible to define two main chronological stages of spatial distribution. Khabur ware I (ca. 2000 – 1800 BC) represents a first stage of possible chronological distinction useful for this dissertation, while Khabur ware II represents a second stage which is very roughly coincident with Šamši-Adad I and Išme-Dagan's kingdoms (ca. 1800 – 1750/30 BC). Given the total absence of workshops from the archaeological record, the only criterion adopted by researchers to roughly identify possible production centres has been the frequency of whole vessels and potsherds yielded by the archaeological sites (see Oguchi 1997b, 205-206; Faivre and Nicolle 2007, 191). On the basis of this assumption, two distribution areas have been defined by Oguchi (1997b; see also Faivre and Nicolle 2007): 1) a core, main distribution zone (Figs. 40 and 41) and 2) a secondary or peripheral distribution zone (Figs. 41 and 42).

The main distribution zone, where the Khabur ware occurs abundantly (see Fig. 43), includes several parts of northern Syria and Iraq: the area around Aššur; the plain south of Jebel Sinjar and Tell ‘Afar; the north-eastern Jazira extending from the northern hills of Tell ‘Afar to the Tigris; the area between Nineveh and Jebel Bashiqa and the upper Khabur basin (Figs. 40 and 41). This zone may have included the site of Tell Fakhariyah to the west, along the Turkish-Syrian border and the sites of the Eski Mosul Dam Salvage Project area to the north, not beyond Jebel Bashiqa to the east, and around Aššur and Tell Aqrah to the south (cf. Oguchi 1997b, 206; Faivre and Nicolle 2007, 193-194). Khabur ware phase I (*ca.* 2000-1800 BC) has been found in five sites in the Khabur Triangle, in four sites in the ‘Afar plain, and in two sites in north-western Iran (see fig. 40).

In the secondary zone, occurrences of Khabur ware are far fewer and the nature of pottery assemblage yielded by the peripheral sites differs from that of the sites located within the main distribution zone. It seems that the Khabur ware appears in the secondary distribution zone at around the late 19th/early 18th century in 36 archaeological sites located in North-western Iran, Upper Mesopotamia, North-western Syria, Central and South-eastern Anatolia (see Figs. 41 and 42).

4.3.4 Intra-site contexts

As I have said above, the only systematic study of Khabur Ware is the one carried out by Schmidt (2013) for Tell Mozan’s area C2 (phases C7-C4). For that reason almost all published items (736 out of 750) from Tell Mozan come from domestic contexts (area C2) located in the middle of the main mound and consequently provide us a very partial and biased picture of the intra-site distribution of this pottery. In addition, the total lack of publications reporting the percentage of Khabur Ware within the overall pottery assemblage from each site does not allow us to estimate how much this kind of ceramic typology was diffused on a local scale. In this case, the only available data come from Tell Mozan and Hirbemerdon Tepe. In particular, at Tell Mozan, in area C2, the Khabur Ware represented less than the 0.5 % of the overall pottery assemblage belonging to phase C7 (ca. 2100-2000 BC), while in the following phases C6-C5 (ca. 2000-1800) it increases up to almost 7% (Schmidt 2012, 165). At Hirbemerdon Tepe, Khabur Ware represents just the 0.19 % of the total pottery assemblage dated to the Middle Bronze Age (D'Agostino 2012, 194). From the available data, it seems that in its first phase of occurrence (ca. 2000-1800 BC), Khabur Ware always constitutes a very small percentage of the overall assemblage, but steadily increases during its second phase (ca. 1800-1750/30 BC).

4.3.5 Quantitative analysis: shapes, contexts and distribution areas

A variety of methods have been used in order to identify the shapes that mostly occur and define the contexts and distribution areas where Khabur Ware has been found. The analyses are based on a database of 2574 items coming from 51 sites distributed over Upper Mesopotamia and central/south-eastern Anatolia during the Middle Bronze Age (ca. 2000 – 1600 BC). A descriptive statistical analysis of the current dataset shows that the most commonly occurring shapes are jars (45%) and bowls (32.2%), with Khabur ware vessels having been mainly found in domestic contexts (Figs. 44 and 45). Nevertheless, for the domestic context it is important to point out that 736 items out of 1449 (51%) come from one site Tell Mozan (see Schmidt 2013).

Most vessels (n=2343) come from northern Syria and Iraq (what Oguchi refers to as the main distribution zone): the area around Aššur; the plain south of Jebel Sinjar and Tell 'Afar; the north-eastern Jazira extending from the northern hills of Tell 'Afar to the Tigris; the area between Nineveh and Jebel Bashiqa and the upper Khabur basin. Beyond this, only a few examples (n=324) come from peripheral sites (Fig. 46). The lack of as much clear evidence of Khabur ware in this secondary distribution zone may suggest that the vessels yielded by the peripheral sites were imports. In addition, in this secondary distribution zones 239 items out of 324 come from just Dinkha Tepe, a site located in the Ushnu-Solduz valley, in north-western Iran (cf. Hamlin 1971 and 1974). Further analyses of Khabur ware shows us that in both outside and within the core distribution zone this kind of pottery comes mainly from domestic and funerary contexts (Fig. 47). That might suggest that Khabur ware vessels were personal possessions related to the private sphere of the daily life, rather than being linked to religious observance or state administration. It is also interesting to notice that the so-called "grain measure" has been found in domestic and palatial contexts, but only once in a grave and never in a religious building (Fig. 48). This may suggest that this ceramic typology was related to a specific kind of activity mainly performed in the domestic and palace contexts and not to any aspect of the religious life.

A chi-squared test was used to confirm the statistical relationship between three variables (Fig. 49) in terms of context (domestic, funerary, palatial and religious), shape (beaker, jars, bowls, "grain measures") and area (the distribution zone where the artefact was found). The results suggest that jars and bowls/pots perhaps were broadly used in domestic contexts for a wide range of daily life functions (e.g. food and liquid containers, cooking, etc.), while beakers/goblets/cups were used either in religious contexts for any sort of ceremonial and offering activities or in funerary contexts as containers of perfumed oils or unguents used for anointing dead. Instead, the "grain measures" may be related with activities of storing and measuring of food performed in the palace contexts. A second test addresses whether there is any association between context type and distribution area (Fig. 50). These results suggest that, in the main distribution area there are more vessels than expected in the domestic contexts, while in the peripheral zone vessels are mainly distributed in the funerary contexts. This could suggest that the use of Khabur Ware in the main distribution area was mostly devoted to fulfil daily life activities, while in the secondary distribution area Khabur Ware occurs as imports or personal commodities of people and is less related to activities performed within domestic contexts. The third and last test shows that Khabur Ware's shapes and distribution areas are significantly associated (Fig. 51). Put simply, in the main distribution area there are more than expected beakers and bowls, while the jar is the most commonly occurring shape in the peripheral zone. These results suggest that perhaps bowls and beakers were used in the main distribution area for daily activities, while the jar, given its shape and medium size, could be suitable for the transportation of liquids or foods over long-distance in the peripheral zone.

4.3.6 Discussion

The original production area for Khabur ware may have been the Khabur and Afar plains, as suggested by the spatial distribution of its earliest evidence and by the frequency of potsherds and whole vessels found. The early distribution of Khabur Ware in in the Ushnu-Solduz valley (north-western Iran) at Dinkha tepe (Dinkha IV, phases b-c) and Hasanlu (north-western Iran) is more difficult to explain, but the fact that at Dinkha Tepe the Khabur ware constituted 13% of the whole ceramic assemblage may suggest that this kind of pottery was produced locally (see Hamlin 1971). If we accept that Khabur Ware starts earlier in the Jazira, we may speculate that this kind of pottery is, to some extent, the result of local imitation in north-western Iran. In addition, this cultural transmission may be related, to some extent, to the trade contacts between those two areas. For instance, foreign merchants, involved in the tin trade circuit to the east of the Zagros Mountains, brought tin to Aššur.

In the following phase II (ca. 1800 – 1750/30 BC), Khabur Ware spreads mostly across all the northern Jazira and sporadically to the west of the Euphrates in south-eastern Anatolia, in the Amuq valley and in central Anatolia (only at Kültepe). A visual inspection of Khabur Ware's frequency shows a decrease to the farther sites from the Khabur Triangle and the 'Afar plain, the supposed areas of origin of this pottery (Fig. 43). The isolated presence of Khabur ware to the west of the Euphrates during its second phase could be related to factors such as long-distance trade contacts, diplomatic relationships, and military dominance, but the exact reasons remain unclear. The presence of a competing trade circuits in northwestern Syria and the presence of a political entity such as the Kingdom of Yamkhad and Qatna, could have limited the spread of the Khabur Ware to the west of the Euphrates River. On the other hand, the distribution of Khabur Ware within the northern Jazira could be the result of a shared cultural *milieu* between the Amorite dynasties and kingdoms in the area (see Schwartz 2013 for a good discussion). In this cultural and political context, the spread of particular classes of objects could be stimulated by close diplomatic relations as well as by the exchange of gifts between the Amorite kings. As the documents from Mari reveal, the Amorite kings of Syria and Mesopotamia were in continual contact, sending emissaries from court to court to ascertain the actions and the intentions of each ruler, to make deals and conclude alliances (Durand 1997-2000; Heimpel 2003). From this perspective, the spread of Khabur Ware in north-western Syria can be the result of the contacts among the Amorite dynasties that also contracted inter-dynastic marriages (e.g. between Zimri-Lim of Mari and the daughter of the king of Yamkhad, Šamši-Adad I's son and the daughter of the king of Qatna). The find of Khabur Ware at Tilmen Höyük, in south-eastern Turkey, could be a by-product of a trade network, operating from Babylon and Sippar through Syria and into Anatolia, with the aim of acquiring Anatolian raw materials (e.g. copper, wood, etc.; Marchetti 2003, 2009 and 2010), but this must remain speculation. Considering the extent of Šamši-Adad I's kingdom, we may also wonder whether this hegemonic political entity could have favoured the spread of Khabur Ware within the northern Jazira during the phase 2 (Fig. 52). Furthermore, the presence of Khabur ware at Lidar Höyük and at Imikuşaği could be the result of the trade route crossed by the Assyrian merchants along the upper Euphrates leading to Kaneš via Malatya. The presence of Khabur ware at Kültepe's lower town Ib may suggest that the spread of this kind of painted pottery in Upper Mesopotamia was also related with the activity of Assyrian merchants. Kültepe's lower town Ib has yielded 6 small cups with horizontal painted bands coming from graves. This may suggest that Assyrians brought with them Khabur ware as pottery with symbolic meaning (grave goods symbolizing the goods possessed by the deceased when he was in life) and as household private commodity (Oguchi 1997b, 208).

4.4 Scales and weighing systems

4.4.1 General characteristics of balance weights

The study of balance weights can help to inform us about the measurement of goods for trade and/or materials associated with metallurgical activities. It thereby offers us an opportunity to understand a variety of socio-cultural activities, including either everyday local exchange or long-distance trade. In particular, the spatial distribution of a particular weight system of measurement and its overlap with others can provide us with clues about the coexistence and interaction of different polities and/or trade systems. Therefore, the circulation of raw materials and goods from far areas (e.g. Indus Valley, Persian Gulf, Mesopotamia, Egypt, eastern Mediterranean, and Anatolia) within a network of long-distance commercial contacts, developed conversion systems that enabled mutual equivalence between different weight systems and facilitated international trade and exchange. More simply, the main function of a given weight system was that seller and buyer exchanged a standard quantity of goods and raw materials. Some objects such as metal ingots were produced to weigh a standard specific amount in order to facilitate the conversion into different weight systems (Mederos and Karlowsky 2004, 200).

In the present state of our knowledge, there is now undisputable evidence of the use of standardized different metrological systems in the ancient Near East and Eastern Mediterranean since the middle of the third millennium BC (Rahmstorf 2006b, 32; 2010). In fact, thanks to the work of several researchers on published and unpublished materials over the past decades it has been possible detect different weight systems with different basic standards in use between the third and first millennia BC (see Fig. 53 for a review of current proposals about the weight systems) in Upper Mesopotamia, northern Syria and central/south-eastern Anatolia (Fig. 54):

- a Syrian System with a unit of 7.83 g (shekel = 7.83 g; mina = 470 g; talent = 28,200 g), 60 shekel per mina, 60 mina per talent;
- a Levantine or Ugarit system with a unit of 9.4 g (shekel = 9.4 g; mina = 470 g; talent = 28,200 g), 50 shekel per mina, 60 mina per talent;
- an Anatolian system with a unit of 11.75 g (shekel = 11.75 g; mina = 470 g; talent = 28,200 g), 40 shekel per mina, 60 mina per talent;
- a Mesopotamian system with a unit of 8.55 g (shekel = 8.55 g; mina = 513 g; talent = 30,800 g), 60 shekel per mina, 60 mina per talent;
- an Aegean system with a unit of 6.71 g (shekel =6.71 g; mina = 470 g; talent = 28,200 g), 70 shekel per mina, 60 mina per talent.

The Aegean, Syrian, Levantine and Anatolian systems were characterized by a common value (called the *mina* in some instances) of 470 g, which could be respectively subdivided into 70, 60, 50, 40 units. Instead, the Mesopotamian sexagesimal system was linked to a unit of 513 g. Therefore, an important aspect to point out is the possible overlap of units of several different weight systems (see Fig. 55). For instance, a balance weight with the mass of 47 g may be a representative of a Syrian shekel of 7.83 g (6 x 7.83), of a Levantine/Ugarit shekel of 9.4 g (5 x 9.4), of an Anatolian shekel of 11.75 g (4 x 11.75), or of an Aegean shekel of 6.71 (7 x 6.71).

Some scholars have stated that it is doubtful that the weight mesurements in the third and second millennium "were so accurate as to exclude an error of less than 1 g" (Mederos and Lamberg-Karlowski 2004, 202; see also Rahmstorf 2006b, 12). This statement is very unlikely because the Mesopotamian texts show that the shekel consisted of 180 grains (še in Sumerian; see Neugebauer and Sachs 1945, 4-6; Hafford 2005, 37). Such a weight unit would be approximately 0.05 grams and would confirm the capability of Mesopotamian people of weighing in very tiny amounts.

Beside the weight systems described above, Parise and Zaccagnini have proposed the existence of "hybrid" metrological systems that may have been used for facilitating the measurement and exchange of particular goods. They have proposed the existence of a system with a mina of 660-680 g that may have been used for weighing wool (Parise 1991; Zaccagnini 1999-2001, 51-54), one with a mina of 420 g that could be subdivided into 50 units of a shekel of 8.4 g (Parise 1994, 18-21; Zaccagnini 1999-2001, 45-48) and a system with a mina of 564 g subdivided into 60 units of a shekel of 9.4 g (Zaccagnini 1999-2001, 39-45).

During the Middle Bronze Age, the most common morphology of balance weights is the ovoid or barrel-weight, usually called sphendonoid (see Fig. 56:1-8). These weights are mostly made in fine-grained dark stones (e.g. hematite, diorite, basalt) and tend to have a rounded bi-conical shape with rounder and thinner ends or with cut ends. This kind of weights can be flattened or un-flattened along one side. Flattening sphendonoid along one side could be due to the need to make a base on which the weight could lie steadily (Hafford 2012, 27). One flattened side sphendonoid appears to be less common in the Early Bronze Age and more common in northern Mesopotamia during the second millennium (Hafford 2005, 350). Other rarer shapes were spherical, cylindrical, discoid, hemispherical, domed-shaped weights and zoomorphic (Fig. 56:9-18).

The most common material used in balance weights during the Middle Bronze Age is hematite. Roughly 60 % of the weights recorded in the present study are made of this iron oxide. Hematite is a good material for making weights because it is durable, dense, impermeable and highly polished. The use of this material is particularly common for the balance weights of smaller value and less common for the heavier ones. This could be due to the difficulty of carving dense hematite or to the availability of this mineral as small pieces washed out of riverbeds or other sedimentary deposits. A recent literature survey of geological deposits of known hematite sources that may have been exploited during the early 2nd millennium has revealed that this kind of iron oxide was available in all regions around Mesopotamia from Anatolian western coasts to eastern India (cf. Mulder 2008; de Vries et al. 2010; see Fig. 57).

4.4.2 The dataset and its limits

The study and analysis of balance weights encompasses a series of problems that have already been reported by Massa (forth.), and which I will briefly revisit here. First, the small dimension of these objects makes them easy to misplace and miss in archaeological excavations lacking of a careful stratigraphic methodology. Second, in the oldest publications the excavators have not always managed to recognize the material of the balance weights and in several cases have classified iron oxides simply as stone objects (see Imberti *et al.* 2008; Mulder 2010). Thus, it is also difficult to assess the likely provenance of raw materials with which balance weights were produced. Third, in many cases the balance weights have been retrieved chipped or broken, so that it is difficult or impossible to reconstruct their original weight and consequently to assess to which unit of measure and weight system any single item may have belonged (Mederos and Karlowsky 2004, 202; Hafford 2012, 33). Fourth, these objects could be subject to lateral cycling that makes it tricky to discern their original provenance and period of use (Ascalone and Peyronel 2006b, 66-67). The fifth and final issue is that balance weights have not received sufficient coverage in archaeological excavation reports as their value and importance are too often underestimated by excavators.

In the present study, just 10 sites with occupation documented for the Middle Bronze Age (ca. 2000 – 1600 BC) in Upper Mesopotamia and Central Anatolia have yielded balance weights. Precisely, 376 items have been found in those sites. Tell Mardikh (Ebla) is the site yielding the highest number of examples (n=193) as it was the subject of the only systematic and well documented study ever carried out on a site about balance weights (see Ascalone and Peyronel 2000, 2001, 2006a, 2006b, 2006c). Twenty examples from Tell Mardikh are slightly chipped, while twenty are fragmented and so not useful for the analysis concerning the weight systems. In addition, thirteen weights belong to a not well-defined period and have been more broadly dated to the Middle Bronze Age (ca. 2000 – 1600 BC). Another problem in the dataset involves the weights retrieved at Boğazköy, where 7 out of 15 have been roughly assigned to a time span including both the Middle and Late Bronze periods (ca. 2000 – 1200 BC). Another important issue to point out is the dataset of balance weights (N=54) from Qalat Sharqat, the ancient Aššur. Unfortunately, no systematic study has ever been carried out on the corpus of balance weights coming from this site and the only existing publications (cf. Unger 1918; Karwiese 1990; Zeyrek – Kiziltan 2005) report neither the context nor the period of each item. Nevertheless, according to Ascalone and Peyronel those objects could be most likely dated to the Middle to Late Bronze Age Period (2006, 424).

4.4.3 Diachronic and spatial distribution of different weight systems

In northern Syria, Tell Mardikh (Ebla) is the only site with a systematic and well documented study (c.f. Ascalone and Peyronel 2006a and 2006b). Other sites such as Umm el-Marra, Hama, and Tell Mishrifé (Qatna) have yielded no examples of balance weights, while Tell Tuqan and Tell Bi'a have respectively yielded just one and two weights (Ascalone and Peyronel 2006c; Miglus and Strommenger 2007, 29, 50). Particularly surprising it is the total lack of evidence from the Upper Khabur and the Balikh's valleys from important sites such as Tell Leilan (Šubat-Enlil), Tell Brak (Nagar), Tell Mozan (Urkeš) and Tell Hammam el-Turkman. Along the Middle-Euphrates valley just Tell Munbaqa and Mari have respectively yielded four and two weights (Czichon and Werner 1998, 202, pl. 92; Parrot 1959, 80). In northern Mesopotamia balance weights (n=54) have been found just at the site of Aššur (cf. Unger 1918; Karwiese 1990; Zeyrek – Kiziltan 2005). In central Anatolia evidence comes exclusively from the levels II, Ib and Ia of Kültepe's lower town (91 items; Özgüç and Özgüç 1953, Özgüç 1986b) and from Boğazköy (15 items; Bittel et al. 1957; Boehmer 1972). In south/south-eastern Anatolia Tell Atchana has yielded thirteen balance weights (Arnaud 1967, 153-155) and Korucutepe just one marble weight (Van Loon 1980, 139).

Given the scantiness of archaeological evidence and the total lack of examples from Aleppo, Hama, Tell Mishrifé (Qatna), and Karkemiš it is difficult to assess what was the geographic area within the Syrian weight system was used. On the basis of written sources we may suppose that Karkemiš was the northernmost place where the Syrian weight system was in use, while it is difficult to establish the southern boundary if we consider that there is no available data from Tell Mishrifé and Hazor (Durand 1982, 118-119). Outside its main distribution area, the Syrian shekel has been found in central Anatolia at Kültepe and in northern Mesopotamia at Aššur (Fig. 58).

The Mesopotamian weight system started spreading in Syria and in the Levantine coast in the early second millennium BC. The Mesopotamian shekel (8.4 g) was used as local standardized weight unit at Aššur, Ebla, Alalakh, Mari, Gezer and Jericho. At Kültepe and Boğazköy the Mesopotamian shekel spread as unit of the metrological system used by the Assyrian merchants (Ascalone and Peyronel 2006b, 152; see Fig. 58).

The Levantine weight system was mainly used through the Syrian-Palestinian coast and facilitated the conversion of goods from neighbouring regions such as Egypt, whose metrological system was based on the *qedet* of 9.4 g since the XII dynasty (ca. 1991-1803 BC, Ascalone and Peyronel 2006b, 156). The Levantine shekel spread also outside it primary distribution area as witnessed by the examples found in Kültepe's lower town and at Aššur (Fig. 58).

In Anatolia, the existence of a local metrological system was likely in use from the early second millennium BC onwards. It is quite surprising that just six weights out of 81 from levels II and Ib of Kültepe's lower town are related to the Anatolian shekel (11.75 g). Nevertheless, that sample cannot be regarded as representative of the local population because Kültepe's lower town was inhabited by both Anatolian and Assyrian merchants. The Anatolian weight system, outside its main primary area, has been retrieved at Tell Mardikh/Ebla (31 examples) and at Aššur (5 examples) as evidence of inter-regional contacts between north-western Syria, Upper Mesopotamia and Anatolia in the early second millennium BC (Fig. 58). The Aegean weight system spread from its primary distribution zone in the Aegean over Anatolia and Levantine coast (Fig. 58). Four examples come also from Aššur (Unger 1918; Karwiese 1990).

4.4.4 Intra-site contexts

The balance weights recorded in the present study come from public palaces, military structures, private residences and houses and from religious buildings testifying their use in different contexts and in a wide range of daily life activities. At Tell Mardikh 106 weights out of 193 (55 %) come from palace contexts (see Acalone and Peyronel 2006a). The evidence suggests that balance weights were surely part of the equipment for performing metrological activities, which were one important function of the centralized administration of a palace. Particularly interesting is the spatial distribution of balance weights in the north-eastern area of Western Palace Q, which seems to indicate a relationship between administrative, metrological and craftsmanship activities (Ascalone and Peyronel 2006a, 135). At Tell Mardikh 11 weights have been found in religious contexts. Two specimens have been found in the temple N and could be interpreted not just as metrological and administrative tools but also as symbolic objects strictly related with the judge's role played by the Sun-God Shamash (Ascalone and Peyronel 2001, 10). Another 9 items have been found in Ištar's sacred area (Area P) but they cannot be associated to any sort of building (Ascalone and Peyronel 2006b, 246-248). Twenty weights come from private houses located in Tell Mardikh's area N and E and testify for some kind of economic activities carried out by their owners (Ascalone and Peyronel 2006b, 132-133). Thirty five weights come from defensive buildings such as the Northern Fort (area AA) and the Western Fort (area V) and their spatial distribution suggests a relationship with storage, food preparation and craft activities (Ascalone and Peyronel 2006b, 214-220).

Tell Atchana has yielded 13 weights: 7 items from unknown contexts and 6 items from the level VII of Yarim-Lim's palace. A brief look at the spatial distribution of the weights found in the palace can provide us some indications about the variety of metrological procedures performed in the building such as stone working and storage activity (Ascalone and Peyronel 2006a, 137) and official weighing activity performed by the administration of the palace (Ascalone and Peyronel 2000, 34-35).

Tell Hariri (Mari) has yielded just two duck shaped weights found in the rooms S. 54 and S. 134 of Zimri-Lim's palace. The location of those weights in two rooms flanking the large courtyards 106 and 121 of the palace suggest that they were perhaps linked to Mari's kingship and in some way related to the diplomatic, administrative and ceremonial activities that likely took place in the two courtyards (Ascalone and Peyronel 2000, 27). Also Tell Bi'a has yielded just two weights from the rooms M and F of Palace A related with the administrative and storage activities (Miglus and Strommenger 2007, 29, 50).

In Upper Mesopotamia, Qalat Sharqat (Aššur) has yielded 54 weights whose context is unknown for almost all of them. From the published material we know just the context of two weights found in the tomb 2506 (Unger 1918, n. 66 and 75; Karwiese 1990, n. 1257 and 1262).

In Anatolia, Böğazköy has yielded 15 specimens from unknown contexts. In Kültepe's lower town, 91 weights have been found: 73 specimens come from domestic contexts, 8 from tombs and 10 with unknown provenance (see Özgüç and Özgüç 1953; Özgüç 1986b). Unfortunately, in the publication, the excavator does not specify exactly which house or which room any single weight has been found, so that it is impossible to assess for each domestic unit of the lower town to which kind of activities were the weights related.

4.4.5 Quantitative analysis: materials, shapes, contexts and weight systems

A variety of methods have been used in order to identify the shapes and materials that mostly occur, define the most recurrent area and context where the balance weights were found and detect different standard weight units. The analyses are based on a database of 376 items coming from ten sites located in Upper Mesopotamia and central/south-eastern Anatolia during the Middle Bronze Age (ca. 2000 – 1600 BC). As already stated in paragraph 4.1, the present dataset is characterized by some limits such as fragmented or slightly chipped weights, unknown provenance contexts and uncertain chronological resolution. Hence, the number of items analysed will vary according to the data available for each different kind of analysis performed.

Indications about a wide range of materials are available for 373 balance weights. Nevertheless, given the lack of accurate mineralogical analyses sometimes the evidence is doubtful and in some cases just the colours of stones have been indicated in the publications. The simple bar chart and table (Fig. 59) show the frequency and percentage of materials with which balance weights were produced in Upper Mesopotamia and Anatolia during the Middle Bronze Age. It is evident that there was an absolute predominance of hematite (55.6 %), while it appears that the use of other stones is quite occasional. Limestone (15.2 %) and basalt (7.7 %) are respectively the second and the third most used materials and they were generally adopted for heavy weights. In fact, the heaviest weights recorded in the present study are two fragmented limestone duck-shaped weights weighing 17.44 kg each found in Aššur. Limestone was a very common stone in alluvial areas in Mesopotamia and its manufacture was rather easy for producing both simple spherical and more complex zoomorphic (e.g. duck-shaped) weights. Particularly interesting is the finding of fourteen lead weights (3.7 %) coming exclusively from Kültepe's lower town (13 items) and Böğazköy (1 items). A chi-squared test was used to address statistically if there is any association between two variables (Fig. 60) in terms of materials and area (the distribution zone where the weights have been found). I divided the distribution area into three zones: Central Anatolia, Northern Syria and Northern Mesopotamia. Unfortunately, the latter one has yielded evidence just from Aššur for the Middle Bronze Age. In this test a p-value < 0.001 reveal that weights' materials are associated with particular distribution zones. Particularly interesting is the fact that there are more than expected hematite weights in central Anatolia and northern Syria, while less than expected hematite weights in Northern Iraq (Fig. 60). This may be due to the fact that hematite sources were mainly distributed along the Levantine coast and central/south Central Anatolia. Instead, in Upper Mesopotamia the closest known sources of hematite were located behind the Zagros Mountains and in North-Western Iran. So, the distance from hematite sources could have affected the frequency of hematite weights over Upper Mesopotamia and Anatolia. Another interesting aspect is that in Northern Mesopotamia there are more than expected limestone weights. This is related to the large availability of limestone in the Mesopotamian alluvial plains. Another important aspect to point out is that lead weights have been found just in Central Anatolia (Kültepe and Böğazköy) and their presence could be related with the abundant sources of lead distributed throughout Anatolia.

A descriptive statistical analysis of the current dataset (Fig. 61) shows that the most commonly occurring shape is the sphendonoid (50.8 %), while rarer shapes include the sphere (12 %), the cylinder (6.4 %), the duck (6.1 %), the ovoid (5.1 %), the pebble (4.8 %) and the hemisphere (3.2 %). Complex shapes such as the lion and frog (respectively 0.5 % and 0.3 %) were particularly rare and may have required unusual craftsmanship and a high cost of production. A chi-squared test (p-value <0.001) reveals that balance weights shapes have association with materials. Particularly significant is the relationship between sphendonoid weights and hematite, a material composed of 70 % of iron and having a high specific weight, which allows the production of small shaped weights. In fact, just 21 sphendonoid weights out of 191 have a mass higher than 100 grams. Another important association is between limestone and spherical weights. Only 14 metallic weights have been recorded in the present study and they are only made of lead. This material is associated with a disc shape in 7 weights out of 14.

An analysis concerning the most recurrent contexts where the balance weights were found is not possible for most sites, but is for Tell Mardikh (Ebla). At Tell Mardikh, indications about weights are available for 152 specimens. If we have a look at the simple table and bar chart (Fig. 62) it is quite evident that the number of balance weights is roughly proportional to the area (sq. m) of each context in which they were found. The only big discrepancy is represented by the religious context, where the percentage of balance weights is significantly lower than the percentage of area investigated (6.1 % versus 23.1 %). This general picture can suggest that measurement procedures were performed almost everywhere within a settlement as daily activities performed for a wide range of purposes such as purchase of goods and craftsmanship. Instead, in religious contexts, weighing procedures were performed less frequently and may have been related in some way with particular symbolic meanings or ritual activities (Ascalone and Peyronel 2001, 8-9). In particular, I have also tested if there is a spatial association between certain weight systems and certain kinds of find contexts. Fig. 63 suggests a striking relationship (p <0.049) in which the Syrian weight system is over-represented in the palace areas and under-represented in the military buildings. This could be due to the fact that, at Ebla, the local weight system was mainly related to the official sphere of the palace and used by the administration of the palace for economic activities. Instead, we can see that in the other contexts the five different weight systems appear to be used quite evenly (Figs. 63 and 64).

Further indications about weight systems are available for 310 items coming from ten sites in Upper Mesopotamia and central/south-eastern Anatolia. In total 415 weight systems have been analysed as some items can be related to more than one system. A chi-squared test has been performed in order to assess if weight systems and distribution zones (Anatolia, Syria and Iraq) are significantly associated (Fig. 65). The resulting p- value <0.043 suggests that we have a 4.3 % chance of falsely rejecting the null hypothesis, which states that particular weight systems have no association with particular distribution zones. It is interesting to notice that in Syria and Iraq there are respectively more weights than expected belonging to the Syrian and Mesopotamian systems (Fig. 65). This may indicate that the Syrian and Mesopotamian weight system were mostly used in their original distribution zones. On the other hand, in Anatolia there are less than expected Anatolian weight systems and more than expected Mesopotamian weights. This result could be biased by the fact that almost all weights from central Anatolia (91 out of 106) come from Kültepe’s lower town levels II-Ib and may reflect the commercial activities of Assyrian merchants. The percentage of different weight systems in each zone could also reveal long distance contacts between different regions (Fig. 66). It is quite evident how in all distribution zones, both Syrian and Mesopotamian weight systems are the most represented ones. Nevertheless, while in Northern Mesopotamia the Anatolian and Aegean systems are underrepresented (respectively 8.7 % and 7 %) in Northern Syria they are more recurrent (respectively 13.7 % and 16.3 %). The higher frequency of Aegean and Anatolian weight systems in northern Syria could be explained as the consequence of contacts between Syria, Anatolia and Levantine coast or more simply with the closeness to areas where those two kinds of weight systems were more often used.

A further analysis has been carried out in order to have a more robust description of central tendency and dispersion of standard units (shekel) for each weight system. Excluding both the fragmented and slightly chipped weights, there are 277 items usable for statistical analysis. The table (Fig. 67) and box and whisker plot (Fig. 68) provide a picture for each weight system of the central group of weighed values (in grams) of the standard unit (one shekel) in the batch. We can see that 50% of values fall respectively within the midspread (the difference between the 3rd and the 1st quartiles values) of the Anatolian (between 11.87 and 11.4), Levantine (9.50 and 9.10), Mesopotamian (8.52 and 8.20), Syrian (8 and 7.80) and Aegean (6.75 and 6.47) weight systems. The box and whisker plot shows that in the Anatolian system there is a weight standard unit extremely small (10.50 g) and in the Levantine one a standard unit extremely large (10.20 g). The first standard unit is related to a hematite sphendonoid weight with a mass of 3.5 gr from Böğazköy, while and the second one is related to a quartz sphendonoid with a mass of 10.2 g from Kültepe lower town's level Ib. Therefore, the weight from Böğazköy may not belong to the Anatolian system and be interpreted as a multiple of 2/3 of an Oriental Aegean shekel (with a mass of ca. 5,25 g) or as a multiple of a hybrid mina of 420 grams (e.g. 420/10.5 = 40; 420/5.25= 80; see Özgüç 1986b; 80; Karwiese 1990; Ascalone and Peyronel 2006b, 29, 120), while the sphendonoid from Kültepe could be interpreted as two shekels of the Oriental Aegean weight system. Therefore, the Oriental Aegean shekel of 5.26 g could be have been already in use in the early second millennium BC in the Levantine and Western

Anatolia coasts, but it is an hypothesis difficult to corroborate to the light of the currently very scanty evidence (Ascalone and Peyronel 2006b, 164-168).

A quantitative distribution of balance weights according to system and ratio shows that about 80 % of weights are multiples included within a value equal or lower than 20 shekels (see Figs. 69 and 70). Therefore, the predominance of small standard weights units could be due either to the need to facilitate small-scale transactions and allow one to weigh any kind of object or that the balance weights were mainly applied to a limited range of small-sized items that could be weighed on a small scale.

A final analysis performed in this section addresses the problem to search for a quantum defined as the smallest unit common to a set of measurements of size *n*, so that each measurement is a positive integer multiple of the quantum itself. In the present study, I will make use of the Kendall's cosine quantogram method (1974), a statistics function, which returns goodness of fit error terms that indicate the possibility of a unit weight to be the basis of a quantally configured series of weights in grams. Kendall (1974) defined the cosine quantogram equation as follows:

$$\varphi(\tau) = \sqrt{\frac{2}{n}} \sum_{i=1}^{n} \cos(2\pi X j \tau)$$

Where $\varphi(\tau)$ is the goodness of fit of the potential quantum, N is the population size, Xj is one observation, and term $\sqrt{\frac{2}{n}}$ adds a dependence on the sample size and to allow the cosine quantogram to approach a standard normal distribution for moderate values of n and q. The $\varphi(\tau)$ values of highest upward peaks of this function will be considered as candidates for quanta, but those that exceed the value three are considered statistically significant (cf. Mustonen 2012; Petruso 1992, 72). For guaranteeing reliability in the results, fragmented and chipped weights have been skipped, so that there is a total of 277 weights available for statistical analysis. I have applied Kendall's cosine quantogram to the five weight systems in order to detect the basic standard unit for each of them.

First, I have firstly performed this analysis on 37 weights whose standard unit may be related to the Anatolian shekel weighing 11.75 grams. The table (Fig. 71) and graph (Fig. 72) show clearly that the best results are at the values of 11.6 and 5.6 grams, while the other peak (2.8 g) reflects 1/4 of the Anatolian shekel. Second, an analysis has been performed on 53 weights that may belong to the Levantine system (shekel with mass of 9.4 g). The table (Fig. 73) and graph (Fig. 74) show that the highest peaks are at the values of 9.4 grams and at the multiple of this figure or near it (4.8 g). Third, a further analysis has been carried out on 125 weights whose standard unit could be associated with the Mesopotamian shekel with a mass of 8.53 grams. In this case the table (Fig. 75) and graph (Fig. 76) indicate that best results is at the value of 8.2 grams, while the other peaks reflect multiples of this number (2.1, 2.7, and 4.1) or near it (8.8). Fourth, a further analysis has been performed on 93 weights that may belong to the Syrian system (shekel weighing 7.83 grams). The results (Figs. 77 and 78) show clearly that the best result is at the values of 7.8 grams, while the other peaks reflect multiples of this number (2.5, 2.7, and 3.8) or near it (7.3). The last series of weights analysed are 55 items that may be related to the Aegean system with standard unit weighing 6.71 grams. The table (Fig. 79) and graph (Fig. 80) show clearly that the best results are at the values of 6.8 and 6.6 grams, while the other significant peak reflects multiples of those numbers (3.3). Finally, I performed a last analysis on the total of 277 weights. In this last case, the highest peaks are at the values of 8.3, at a multiple of this number (4.1) and at the value of 7.8 (see Figs. 81 and 82). This could indicate two weight systems: the Mesopotamian and the Syrian ones centred on 8.3 and 7.8 grams respectively. Nevertheless, if we have a look at the graph (Fig. 81) we can see that there are other peaks corresponding with the Anatolia, Levantine and Aegean shekels but their values are low. I will conclude by stating that this final result could be biased by the fact that the Mesopotamian and Syrian weights are better represented in the original sample with respectively 125 and 93 items, while the Anatolian (37 items), the Levantine (53 items) and the Aegean (55 items) ones are underrepresented.

4.4.6 Discussion

Given the scarcity of available data, an exhaustive and comprehensive evaluation of metrology in Upper Mesopotamia and Anatolia during the Middle Bronze age both on a spatial and diachronic scale is not easy to offer. In fact, the only evidence for Middle Bronze Age I (ca. 2000-1800 BC) is 25 weights from Kültepe's lower town level II (ca. 1970-1835 BC) and 5 weights from Tell Mardikh (3 items from the Old Palace, one from the area DD and one from the grave D. 8030). This lack of information undoubtedly limits our ability to trace spatial and diachronic developments in metrological systems and consequently the commercial activities and inter regional contacts related to them during the early second millennium BC. In addition, a big hole in the present dataset is represented by the total absence of data from key sites such as Tell Brak, Tell Leilan and Tell Mozan and from the fact that only the site of Aššur has yielded data from Upper Mesopotamia.

The only site which allows a clear chronological subdivision of the early second millennium is Kültepe's lower town with three distinct archaeological levels: level II (ca. 1970-1835 BC), level Ib (ca. 1835-17th c. BC), and level Ia (ca. 1700-1685 BC). In Kültepe's lower town out of a total of 91 weights 25 come from the level II, 46 from the level Ib, 10 from the level Ia, and 10 from unknown period. Of course, given the scantiness of available data it does not make so much sense comparing the frequencies of each weight system within each archaeological period. Nevertheless, if we analyse the evidence (71 weights) dated to the Old Assyrian colony period (levels II and Ib), most weights belong to the Mesopotamian (38 items) and Syrian systems (25 items), while just five examples can be related to the Anatolian system. Unlike what has been said by several scholars, this latter aspect is not so surprising if we consider that all weights published from Kültepe come from the private contexts of the Assyrian commercial quarter. So, the highest frequency of weights (55 %) belonging to the Mesopotamian system and the lowest frequency of weights belonging to the Anatolian system (7 %) are to explain with the trade activities of Assyrian merchants that simply preferred or used more often the weight system of their land of provenance. In this case, it is a pity that metrological evidence from Kültepe's main mound has not been published yet because it would be useful comparing how the frequency of the local Anatolian system varies according to the contexts of provenance: main mound versus lower town.

However, even assuming that the weights were locally made and employed by locals, they required at least the use of long-distance contacts in the case they were produced with exotic materials not available locally. The data have shown that there is a spatial association between the materials with which the weights have been produced and their distribution zones. What is evident is that weights were mostly produced with local raw resources without excluding the employment of materials coming from far-off lands. In this context, the widespread use of hematite as privileged raw material for producing weights may be ascribed to an intense activity of extraction and then distribution through a well-established commercial network of long-distance exchanges. The available evidence shows that balance weights are mostly between 7 and 100 grams and suggest that metrological systems were mainly applied to a limited range of goods with a low weight and presumably high value such as precious stones (e.g. lapis lazuli, carnelian, crystal, marble, jasper) and precious metals (e.g. gold, silver, tin).

The spatial overlap of five different weight systems over great distances shows the presence of different interlocking and intersecting commercial circuits and spheres of interaction among Mesopotamian, Syrian, Levantine and Anatolian communities. Therefore, the widespread Mesopotamian weight standard unit system in Upper Mesopotamia, Syria and Central Anatolia in the early second millennium BC could have been fuelled either by the commercial activities of the Assyrian traders or by the establishment of Amorite inter-regional political entities such as the Šamši-Adad I or Zimri-Lim's kingdoms. In addition, the spread of the Syrian and Levantine standard weight units in Central Anatolia show the overlapping of two different competing trade networks: a westerner one based on the axis between Anatolia and the Syrian-Levantine region, and an eastern one based on the commercial system set up by the Assyrians.

Although our sample is based on the evidence coming only from the site of Tell Mardikh (Ebla), it seems that on an intra-site scale the local weight system was used mainly in the palace context by suggesting an official control of the palace administration and bureaucracy over weighing activities performed within the royal seat of power. In this framework, particular morphologies such as the lion and duck-shaped weights could have been respectively adopted as official tools of the palace administration in Syria and Mesopotamia (Ascalone and Peyronel 2001, 34-35). In addition, the adoption of one or more standard weight units inevitably implied some sort of craft specialization as confirmed by the finding in more than one context at Tell Mardikh (Ebla) of balance weights found in area devoted to craftsmanship activities and storage (cf. Ascalone and Peyronel 2006a).

In the end, the application of descriptive statistics for measuring the central tendency and dispersion of mass of weight standard units (in grams) and of Kendall’s cosine quantogram have confirmed the values of weight standard units proposed by most scholars for each system. At this point, given the number of different current proposals about the weight systems’ standard unit (see figure 53), I adopt a more cautios and “fuzzy” approach and I propose a range of values within the shekel’s weight may fall. With this uncertainty in mind, we can link each weight system with the following standard units:

- The Anatolian shekel between 11.20 and 11.90 grams;
- The Levantine shekel between 9.10 and 9.60 grams;
- The Mesopotamian shekel between 8.2 and 8.8 grams;
- The Syrian shekel between 7.5 and 8.1 grams;
- The Aegean shekel between 6.4 and 6.8 grams.

Even though the Anatolian, Levantine, Syrian and Aegean weight systems were based on the mina of 470 grams and the Mesopotamian system on the mina of 513 grams, other kinds of minas better known as “hybrid” were adopted throughout Near East. In fact, the archaeological and textual evidence seems to indicate the use of a particular hybrid mina of 650-680 grams for weighing wool since the second half of the third millennium BC (Parise 1991; Zaccagnini 1999-2001, 51-54; Ascalone and Peyronel 2006b, 27). Other examples of hybrid mina that could have been in use since the second half of the third millennium BC are one with mass of 420 grams and another one with mass of 564 grams (see Parise 1994, 18-21; Zaccagnini 1999-2001, 39-48;

Ascalone and Peyronel 2006b, 28-29). Therefore, it seems that the use of hybrid weight systems could be related to the need to facilitate an interregional scale commercial transactions and exchanges of different kinds of goods, which could be now weighed according to well defined weight standard units used in various regions.

4.5 Seals and sealing

4.5.1 General characteristics of sealing technology and regional styles

Sealing provides a way to guarantee authenticity, mark ownership, indicate participation in legal transactions, and centralize the management and protection of goods. Its study therefore offers an opportunity to understand a variety of socio-cultural activities such as daily, local trade or long-distance trade exchanges. In particular, as in the case of the weighing systems discussed above, the spatial distribution of a particular regional glyptic style and its overlap with others can provide us with clues about coexistence and interaction between different polities and/or trade systems. The circulation of raw materials and goods from far away areas (e.g. Indus Valley, Persian Gulf, Mesopotamia, Egypt, eastern Mediterranean, and Anatolia) coevolved with a network of long-distance commercial and political contacts and with a set of sealing practices that enabled property control both at the public level of the centralized palatial administration and at the private level of the household.

Two main types of seals were in use in Upper Mesopotamia and central/south-eastern Anatolia: the cylinder seal and the stamp seal (Fig. 83). By the early second millennium BC, cylinder seals were widespread throughout the whole Near East, while the stamp seals are found just in central Anatolia if we exclude 3 examples from Tell Bi'a (Otto 2004) and 2 from Tilmen Höyük (Marchetti 2011, 80, 94; Fig. 83). The introduction of the cylinder seal in Anatolia could be directly related to the introduction of clay tablets and envelopes by the first Assyrian merchants, while the native carving of stamp seals could belong to a much older and separate Anatolian tradition (Teissier 1994, 55; Larsen and Lassen 2014, 179).

Generally, in archaeological excavations, the objects on which seals were impressed (e.g. bullae, tablets, envelopes, lump of clay) occur more frequently than the seals themselves. For instance, in the database created for the present research 2207 out of 2515 records are impressions recorded on tablets, bullae, envelopes and object or door sealings, with the small remaining number being actual seals. In addition, it is more informative to be able to acquire data from impressed objects because we thereby get two kinds of evidence: the seal itself with all of its attributes (design, style, iconography and owner's identity if there is an inscription) and the sealing practice (see Collon 1990, 19; Özguç and Tunca 2001, 127; Otto 2004; Collon 2005, 113).

Perhaps the practice of rolling cylinder seals on a clay tablets (e.g. legal contracts, treaties, treaties, etc.) became common during the Ur III period (Collon 2005, 113), but nevertheless, it seems that in Upper Mesopotamia and central/south-eastern Anatolia during the Middle Bronze Age I (ca. 2000 – 1800 BC) the widespread practice was to seal the envelopes of tablets rather than the tablet themselves. There are only one example from Tell Bi'a (see Otto 2004) and two from Kültepe's lower town level II (ca. 1970-1835 BC) of sealed tablets so far published (Özguç 1989, Pl. 39:1, 2; Teissier 1994, 9). In this period Kültepe's lower town level II has yielded seal impressions from 1080 envelopes and two tablets. This is in contrast with Kültepe's lower town level Ib (ca. 1835-17th c. BC), which has yielded 124 tablets and only 33 envelopes bearing seals impressions. In fact, the sealing of tablet envelopes in merchant archives was a practice particularly common at Kültepe during the Old Assyrian colony period (ca. 1970-1700 BC). Tablets were enclosed in sealed clay envelopes forming an inviolable box on which, in most cases, a summary of the text inside was written (Teissier 1994, 10; Collon 2005, 116). The envelopes were mainly in use for the first centuries of the 2nd millennium BC and afterwards were gradually replaced by sealed tablets (Collon 1997, 18; Collon 2005, 116). Several studies have focussed on the procedure of sealing documents and on who was entitled to seal and in which circumstance (cf. Stein 1994; Teissier 1994; Özguç 2006). Nevertheless, it is difficult to reconstruct the identity of the sealer because most seals were uninscribed and sometimes, when an inscription is present, the name of the person sealing does not correspond with the real sealer as seals were shared and borrowed among members of a family or commercial partners

(Teissier 1994, 16-17, 46-47; Collon 1997, 18; Larsen and Lassen 2014). In addition, the assumption that an Old Assyrian merchant could have owned more than one seal is plausible, given the amount of commercial and storage activities to organize between Aššur and commercial colonies in Anatolia (see Larsen 1977, 78; Matouš and Matoušová-Rajimová 1984, 88; Veenhof 1987; Teissier 1994, 45). The find of three different Old Assyrian seals in a single grave at Aššur may support this hypothesis (see Moortgat 1954, nos 506-508; Preusser 1955, 10-11).

The variety of styles and iconographic motifs is one of the most interesting aspects of the study of glyptic and there is now undisputable evidence of the use of seals belonging to different regional styles throughout Near East in the early 2nd millennium BC. However, a full analysis of styles and iconography is far beyond the scope of the present work, which is mostly concerned with the study of spatial distribution of sealing practices and the detection of trade patterns and routes in Upper Mesopotamia and central/south-eastern Anatolia. In fact, thanks to the work of several researchers on published and unpublished materials from Kültepe and other centres, over the past decades it has been possible to distinguish four different regional styles (Fig. 84): an Assyrian, a Babylonian, a Syrian, and an Anatolian style. The Old Assyrian seals are based fairly closely on Ur III styles due to the presumed influence exerted on local manufacture at the time of Aššur's dominance by Ur III's empire (Teissier 1994, 52; Collon 2005, 41). In addition, the Old Assyrian style can be divided into two main substyles: the "classic" or "OA 1" and the "Assyro-Cappadocian" or "OA 2" substyles (see Lassen 2012; Lassen 2014, 108-115; Larsen and Lassen 2014, 180-183). The "classic" Old Assyrian sub-style shows a conservative repertoire of stylistic and iconographic characteristics and few foreign cultural traits (Lassen 2014, 109). Although most seal impressions come from texts dated to a 30-year period (ca. 1895-1865 BC), the earliest evidence of this style is dated to the first generation of Assyrian merchants (ca. 1945 BC, REL 31-40; Lassen 2014, 116-117; Larsen and Lassen 2014, 180). Instead, the Assyrian-Cappadocian substyle is the result of blending many original traits of the classic substyle with new motifs and composition types increasingly resembling Anatolian characteristics (Lassen 2014, 113-115; Topçuoğlu 2014, 128-129). This substyle appears firstly around 1890 BC and becomes the

dominant Old Assyrian substyle from around 1880 BC to the end of Kültepe's lower town level II (ca. 1835 BC; see Lassen 2012, 180; Lassen 2014, 116-117.).
The Old Babylonian style is a term indicating the glyptic typical of Mesopotamia from ca. 1900 BC to about the end of Hammurabi's dynasty in 1595 BC. Glyptic from ca. 2000-1900 BC is called Early Old Babylonian or Isin-Larsa. The majority of Old Syrian seals date from ca 1850 to 1620 BC and have an iconography more eclectic than any other glyptic style of the ancient Near East because Syria was crossed by several major trade routes and fragmented into a series of independent and satellite political entities (Teissier 1984, 75; Otto 2000; Keel-Leu and Teissier 2004, 269).

The most common material used in seals during the Middle Bronze Age is hematite, and in the British Museum collection roughly 70% of the seals from this period were made of this iron oxide (Collon 1986). This kind of material was used for almost all good quality seals in the first four centuries of the 2nd millennium throughout the whole Near East, but it was barely used in the earlier and later centuries (Collon 1990, 36).

4.5.2 The dataset and its limits

Seals and seal impressions have been recorded in a database according to their typology (cylinder or stamp seal), materials, type of impressed clay object (e.g. bullae, tablet, and envelopes), period, style and context of provenance. In total, the database is composed of published items (n = 2515) dated to the Middle Bronze Age (ca. 2000-1600 BC) and coming from sites distributed in Upper Mesopotamia and central/south-eastern Anatolia (Fig. 85). The published data come from the excavations reports of archaeological sites yielding seals/impressions, monographs about glyptic found in a specific site and private and public collections. For the purposes of the present study, just the items with known provenance have been recorded (and excluding all seals from private collections). When speaking about Middle Bronze Age seals, I am referring to those items that either come from Middle Bronze Age archaeological levels or can be dated to the early second millennium on the basis of their styles and iconographic motifs. In fact, in some cases seals belonging to an earlier period have been retrieved in later archaeological contexts because they may have been used as amulets/talismans after they had fallen in disuse, were inherited by family member of the same households through several generations, or simply reused by later new owners (cf. Collon 1997, 19-20; Collon 2005, 120-122). Only 9 sites have yielded a total of 1674 seals/impressions dated to the Middle Bronze Age I (ca. 2000-1800 BC). For this period the distribution of recorded seals/impressions is skewed because almost all items (n= 1617) come from the Kültepe’s lower town level II (ca. 1970-1835 BC). A total of 841 seals/impressions dated to the Middle Bronze Age II period come from 28 sites. The highest number of items (n=162) is still provided by Kültepe’s lower town level Ib (ca. 1835-17th c. BC) but to a lesser extent that in the previous level II period.

One aspect to point out when dealing with glyptic is that this kind of material culture has not often received adequate coverage in the publications by excavators because they have not always treated seals/impressions as important archaeological evidence for their research targets. Thus, the number of the published items is a significant underestimation of the real recovered sample.[17] The only work on a regional scale has been carried out by Otto (2000) who attempted to detect sub-groups of Syrian glyptic from ca. 1830-1730 BC on the basis of provenance, iconographic motifs and spatial distribution. Furthermore, glyptic has been mostly studied from an art-history perspective and the actual literature, with the exception of Otto’s work (2000), does not show any geographical and quantitative study of seals/impressions aiming to detect trade/political patterns and routes. Another weakness in the actual archaeological dataset is that the excavators, in the oldest publications, have not always managed to recognize the material of seals and in several cases have classified iron oxides simply as stone objects.

Finally, the recent works by Lassen (2012 and 2014; Larsen and Lassen 2014) and Topçuoğlu (2014) have pointed out that a strictly correlation between ethnicity and seal style is not always true. Prosopographic studies of seal owners, based on Kultepe lower town level II’s clay tablets bearing seal impressions and sealers’ notations, have

[17] Just a few systematic and well documented studies have been carried out about Middle Bronze Age’s seal/impressions from a specific site. In this perspective the most relevant publications are the works by Collon on Tell Atchana (1975 and 1982), by Boehmer and Güterbock on Bögazköy (1987), by Ozgüç and Tunca on Kültepe (Ozgüç 1968; Ozgüç and Tunca 2001; Ozgüç 2006), by Schaeffer-Forrer (1983) on Ras Shamra, by Otto on Tell Bi’a (2004), by Beyer on Tell Meskene (2001), and by Marchetti on Tilmen Höyük (2011).

showed that Assyrians owned seals belonging to the Old Assyrian, Old Babylonian, Old Syrian and Anatolian styles (Larsen and Lassen 2014, 186-187; Lassen 2014, 116-118). More precisely, the first generation of Assyrian traders living in Kaneš owned "classic" Old Assyrian sub-style seals, while later generations (around 1890 BC) owned "Assyro-Cappadocian" Old Assyrian and Anatolian style seals (Larsen and Lasen 2014, 187; Lassen 2014, 118). Instead, it seems that the Anatolians living in Kaneš owned Assyrians and Anatolian style seals and never those ones cut in the Old Babylonian and Old Syrian styles (Gräff 2005, 164; Topçuoğlu 2014, 130).

4.5.3 Diachronic and spatial distribution of glyptic styles

The study of the spatial distribution of glyptic regional styles is important to infer any kind of political and trade contacts between various areas of the Ancient Near East in a given period. This could be possible by detecting patterns of hybridization, where particular traits of different regional styles blend into another one as a result of contacts between different communities (see Larsen and Lassen 2014; Lassen 2014). To do so, it is necessary to analyse the seals with their textual context. In fact, a systematic analysis of seal impressions on clay tablets allows one to date and identify the owner of each single seal. Nevertheless, the seals are usually published separately from their associated texts and vice versa. This makes difficult any kind of prosopographic and chronological analysys. Only the recent work by Lassen (2012 and 2014) has pointed out the importance of a textual contextualized analysis of seals. Her work has showed diachronic patterns of hybridization in the Old Assyrian seal style, where the "Assyro-Cappadocian" sub-style is the results of mutual contacts between the communities of Assyrian traders and Anatolians (Larsen and Lassen 2014, 179-187; Lassen 2014, 115-118). In the light of the issues pointed out above, and, in the impossibility, in the present study, to analyse the seals with their associated texts, the spatial distribution of different regional seal styles in Upper Mesopotamia and central/south-eastern Anatolia during the Old Assyrian Colony Period (ca. 1970-1700 BC) should be read cautiously. Despite the fact that a large amount of data is still unpublished, for the purposes of this dissertation, I have managed to record 29 archaeological sites yielding a total number of 2515 seals/impressions (Figs. 84 and 85). Within this corpus, however, only 9 sites have yielded evidence dating to the

Middle Bronze Age I (ca. 2000-1800 BC), while 28 sites have yielded evidence dated to the later Middle Bronze Age II (ca. 1800-1600 BC). The discrepancy of data between the two periods could be either due to the lack examples of stratified seals/impressions belonging to the earlier period or simply to a different coverage of those two periods in the actual publications. In fact, it seems odd thinking that seals, a class of artefact that is so widely spread and used throughout the Ancient Near East, could show such a different spatial distribution within such a short time span. In contrast, those 9 sites provide 1674 seals/impressions dating to the Middle Bronze Age I versus the 841 seals/impressions from 28 sites dating to the Middle Bronze Age II.

The seals/impressions belonging to the Old Assyrian style come mostly from Kültepe's lower levels (II and Ib), which hosted both Assyrian and Anatolian merchants. At Kültepe 10 seals impressions belonging to three different Assyrian rulers appear on clay envelopes found in the lower town's level II: Erišum I (ca. 1972-1933 BC), Sargon (1917-1878 BC), and Naram-Suen (ca. 1869-36/16BC). These probably reflect the Assyrian king's involvement in Anatolian affair both as the leader of Aššur's city assembly and as private investor involved in the trade activities (Eppihimer 2013, 36-39). Seals belonging to the Old Assyrian style were made both in Anatolia and in Assyria (Larsen and Lassen 2014, 183, 186; Lassen 2014, 118; Topçuoğlu 2014, 130), but we should not ignore the possibility that the most impetus of their distribution was from Aššur to Kaneš rather than vice versa (Larsen 1977, 10; Teissier 1994, 53; Lassen 2014, 107). This problem may be solved by a systematic study and comparison of the style of Old Assyrian seals, but unfortunately Aššur has yielded very little evidence to make impossible that kind of comparison. Seals/impressions of the Old Assyrian style do not come exclusively from Aššur (Hockmann 2010) and Anatolia (Acemhöyük, Bögazköy and Kültepe; cf. Boehmer and Guterbock 1987; Neve 1982; Özguç 1965, 1966, 1980, 1986 and 2006; Teissier 1994; Tunca 1993; Özguç and Tunca 2001), but they have also been found in south-eastern Anatolia (Norşuntepe; Schmidt 2002), north-western Syria (Tell Bi'a and Umm el-Marra; Curvers et al. 1997; Otto 2004), in the Khabur Triangle (Tell Mohammed Diyab; Castel 1990) and in Northern Mesopotamia (Tell Rimah, Parker 1975; Hawkins 1976; Fig. 86).

The introduction of cylinder seals into Anatolia, which had a distinctive stamp seal tradition, is likely to have been due to the commercial settlements set up by the Assyrian merchants in the early second millennium BC (Teissier 1994, 55, 80; Keel-Leu and Teissier 2004, 258; Larsen and Lassen 2014, 179). The distribution of seals/impressions belonging to the Anatolian style is mainly restricted to central Anatolia (Acemhöyük, Bögazköy, Kaman-Kalehöyük, Karahöyük, and Kültepe) with the exception of two cylinder seals from Tell Mardikh (Matthiae et al. 1995, 407) and 3 stamp seals from Tell Bia' (Otto 2004) from north-western Syria and 2 stamp seals from Tilmen Höyük in south-eastern Anatolia (Marchetti 2011, 80-81, 94-95; Fig. 86).

The spatial distribution of seals/impressions belonging to the Old Syrian style is significantly wider than that of the Old-Assyrian and Anatolian groups and spans central Anatolia (Acemhöyük, Alişar Höyük, Bögazköy, Karahöyük, and Kültepe) south-eastern Anatolia (Tell Atchana and Tilmen Höyük), north-western Syria (Minat al-Bayda, Ras Shamra, Tell Ahmar, Tell Bi'a, Tell Mardikh, Tell Mishrife, and Umm el-Marra), the middle Euphrates (Tell Hariri and Tell Ashara), Balikh valley (Tell Hammam et-Turkman), the Khabur Triangle (Chagar Bazar and Tell Leilan) and northern Mesopotamia (Tell Rimah; Fig. 86). It is worth mentioning that in the Sarıkaya Palace at Acemhöyük, cylinder seals impressions of Syrian style are the second largest group after the local style and not strictly indicate close relations between the rulers of this central Anatolian city and Syria (Özguç 1980, 67; Özguç-Tunca 2001, 128). In fact, as I already said above, the Assyrian traders owned also seals belonging to the Old Syrian style.

Very few Old Babylonian seals from Anatolia and Syria can be provenanced, but on the basis of the style it is plausible to assume that the majority of seals may have come from north Mesopotamian sites such as Tell Harmal, Tell Rimah and central and southern Mesopotamian sites such as Babylon, Sippar, Larsa and Nippur (cf. Parker 1975; Hawkins 1976; Larsen 1976, 47; al-Gailani Wer 1988, 22, 56; Teissier 1994, 64). At Tell Leilan, 90 percent of the seal impressions and 75 percent of the seals belong to the Old Babylonian style, but it is difficult to distinguish local Leilan productions from the product of other workshops (Parayre 1990, 556; Parayre 1993, 511). The distribution of seals/impressions belonging to the Old Babylonian style in central Anatolia (Acemhöyük, Bögazköy, and Kültepe), in south-eastern Anatolia (Kenan Tepe, Tell Atchana, and Tilmen Höyük), in the Cilician plains (Gozlu Kule/Tarsus), north-western Syria (Ras Shamra, Tell Bi'a, and Tell Meskene), in the Middle Euphrates (Tell Ashara and Tell Hariri), in the Khabur Triangle (Chagar Bazar, Tell Fakhariya, and Tell Leilan), and in northern Mesopotamia (Tell Rimah) are not necessarily related to the activities of Babylonian merchants. As said above, also the Assyrian traders owned Old Babylonian style seals. To conclude, it seems that the spatial distribution of Old Babylonian, Old Assyrian and Old Syrian style seals throughout Upper Mesoptamia is expression of a pan-Mesopotamian stylistic production and of an Amorite *oikoumene* in which Amorite kings of Syria and Mesopotamia were politically and economically in contacts (Schwartz 2013, 4-5; Fig. 86).

4.5.4 Intra-site contexts

A general overview still shows how seals/impressions mostly come from palatial and domestic contexts, while they are also found in minor quantities from religious buildings, graves and military structures. This testifies to the use of seals in a fairly wide range of contexts, but particularly in administrative and trade activities belonging to the public and official sphere of the palace or to the private sphere of residences and houses.

As I have already noted above, Kültepe is the site which has yielded the highest number of known seals/impressions. The published seals/impressions from Kültepe's lower town come from just a few houses of Assyrian and Anatolian merchants so that there is not any complete coverage of the whole commercial settlement. Actually, the only complete and well documented publication about glyptic evidence from this site is the work by Özgüç (2006) about the seals impressions on clay envelopes from the house of the Anatolian merchant Peruwa and the Assyrian merchant Uṣur-ša-Ištar. Nevertheless, in this work the seals have not been pusblished with their associated written sources. This makes impossible a prosopographic analysis and a clear identification of seals' owners.

Just a few seal impressions have been found on some clay bullae found in the rooms and debris of the Late Palace in the main mound’s level VII (ca. 1970-1835 BC) and in the Palace on the south terrace of main mound’s level VIII (Özguç and Tunca 2006, 131).

The site of Tell Leilan has yielded 41 impressions of 27 seals from the Acropolis and the Eastern Lower Town. The seal impressions found in the acropolis come from the temple of level 2 and belong to some of Šamši-Adad I’s servants, while the seals impressions found in The Easter Lower Town Palace are later and dated to the second half of the 18th century BC (Parayre 1987-88, 1990 and 1993). Particularly interesting is the fact that the seals belonging to the Old Babylonian style are twice as common as the seals belonging to the Old Syrian style (11 versus 6), while in the Lower Town the Old Syrian seals are more numerous than the Old Babylonian ones (7 versus 3). These differences could be due to the fact that the seals found in the Acropolis are dated to the Šamši-Adad I’s kingdom, a period in which the Amorite king strongly promoted the “Babylonization” of northern Mesopotamia (Parayre 1990, 559, 567).

In the Sarıkaya Palace, at Acemhöyük, bullae were found in storerooms. Most bullae show the impressions of the same seals, which means that the palace had long-term contacts with specific firms and traders (Özguç and Tunca 2001, 128). The palace has yielded impressions of seals belonging to Šamši-Adad I, to Dugedu (daughter of Yakhdun-Lim, king of Mari), to king Aplakhanda of Karkemiš, and to one of Yasmakh-Addu’s correspondents. These seals indicate the close relations between Acemhöyük rulers and Amorite kings over at least two generations (Özguç 1980, 62).

The only site which has yielded seals/impressions from a military context, is Tilmen Höyük in the Islahiye Plain of south-eastern Turkey. In particular, the Fortress Q has yielded a door sealing with the inscription of the scribe Lagamal-gamil, a servant of Sumu-la-el, king of Babylon (ca. 1880-1845 BC; Fig. 84:13; Marchetti 2011, 55, 111).

4.5.5 Quantitative analysis: materials, sealing practices, contexts and styles

A variety of methods have been used in order to identify the dominant materials used for glyptic, to quantify the kinds of objects bearing seals impressions, to define the most recurrent regions and contexts where the seals/impressions were found, and to assess the spatial distribution of different regional styles. Given the skewed nature of the Middle Bronze Age I dataset (2000-1800), where seals/impressions come from just 9 sites and almost entirely from Kültepe's lower town level II (1617 out of 1674), a comparison between Middle Bronze I and Middle Bronze II periods in terms of any kind of pattern and spatial configuration is not possible. So, in the present study the analyses will be performed by taking into account the overall Middle Bronze Age's dataset (ca. 2000-1600 BC).

Most of the available glyptic evidence comes from clay objects bearing seal impressions (e.g. tablets, bullae, envelopes) rather than from the seals themselves. Indications about seals' materials are available for 308 items. Nevertheless, given the lack of accurate mineralogical analyses sometimes the evidence is doubtful and in some cases just the colours of stones have been indicated in the publications. The simple bar chart and table (Fig. 87) show the frequency and percentage of materials with which seals were produced in Upper Mesopotamia and Anatolia during the Middle Bronze Age. It is evident that there was an absolute predominance of hematite (43.5 %), while it appears that the use of other stones is quite occasional. If we exclude the general category "stone", steatite (10.1 %), clay (9.4 %), and serpentine (5.8 %) are respectively the second, the third and the fourth most used materials. Steatite and serpentine are common because, like hematite, they allow very fine carving. A chi-squared test was used to address statistically if there is any association between two variables (Fig. 88) in terms of materials and area (the distribution zone where the seals have been found). I divided the distribution area into three zones: Anatolia, northern Syria and northern Mesopotamia (Northern Iraq and Khabur Triangle). Unfortunately, the latter has yielded just four items from Aššur and Tell Mohammed Diyab. A p-value <0.001 suggests an association between seals' materials and distribution areas. Particularly interesting is the fact that there are more than the expected hematite seals in northern Syria, which may be due to the fact that hematite sources were mainly distributed along the Levantine coast and central/south-eastern Anatolia. Another noteworthy aspect is that in Anatolia there are greater than expected frequency of serpentine seals, which may be related to the large availability of this mineral both in northern and western Anatolia.

A descriptive statistical analysis of the current dataset (Fig. 89) shows the frequency and percentage of three kinds of clay objects bearing seal impressions in the Middle Bronze Age: bullae, tablets and envelopes. The table and bar chart show that in the Middle Bronze Age I the most commonly occurring objects bearing seal impressions were the envelopes (72.5 %), while bullae are less common and tablets very rare (Fig. 89). In the Middle Bronze Age II period, the picture changes as the most frequent objects were the bullae (51.7%) and the tablets (37.5 %), while envelopes are less common (Fig. 89). It seems that in Upper Mesopotamia and central/south-eastern Anatolia during Middle Bronze Age I (ca. 2000 – 1800 BC) the widespread practice was to seal the envelopes of tablets rather than the tablet themselves. There is only one example from Tell Bi'a (see Otto 2004) and two from Kültepe's lower town level Ib (ca. 1835-17th c. BC) of sealed tablets so far published (Özguç 1989, Pl. 39:1, 2; Teissier 1994, 9). This is in contrast with the Middle Bronze Age II (ca. 1800-1600 BC) where the number of tablets bearing seals impressions increases strongly (from 0.1 to 51.7 %), while the number of envelopes decreases significantly (from 72.5 to 10.8 %).

At a first glance, the simple table and bar chart (Fig. 89) suggest that seals were used in the private sphere of domestic contexts and in the public sphere of palatial contexts. Instead, in the religious context the sealing practices procedures were performed less frequently and may have been related in some way with particular symbolic meanings or votive activities. However, it is important to point out that this general picture is skewed by the fact that about two thirds of the present dataset is composed of seals/impressions from Kültepe's lower town and the domestic context's occurrence could, therefore, be overestimated. An intra-site analysis concerning the most recurrent contexts where the seals/impressions were found is not possible in the light of the available evidence and the lack of any systematic study about the spatial distribution of glyptic within a specific site. Nevertheless, an analysis on contexts of provenance is still possible if framed into a regional spatial perspective. In particular, indications about contexts and regional styles are available for 2163 seals/impressions coming from 29 sites distributed in Upper Mesopotamia and central/south-eastern Anatolia (fig. 91). A chi-squared (p-value < 0.001) suggests that seals/impressions' styles and contexts for each distribution zones (Anatolia, Syria and Northern Mesopotamia) are significantly associated (Fig. 91). In Anatolia, the seals belonging to the Old Assyrian and Old Syrian regional styles are respectively more than expected in the domestic and palatial contexts (Figs. 91 and 92:a). This is due to the presence of Old Assyrian merchants living in the commercial settlements (*kārum* and *wabartum*) distributed throughout Anatolia and by the commercial and political contacts between Anatolian and Syrian kings as witnessed by some seals found in the Sarıkaya palace at Acemhöyük (cf. Özguç 1980, 67; Özguç-Tunca 2001, 128).

In both Syria and Northern Mesopotamia, seals belonging to the Old Babylonian and Old Syrian styles occur more frequently than expected in religious and palatial contexts (Figs. 91 and 92:b-c), and this can be explained perhaps by the political power over both Syria and Mesopotamia of Amorite kings, who were in continual contact with each other via envoys in order to ascertain political intensions and to make commercial deals (cf. Villard 1986; Durand 1997-2000; Schwartz 2013, 4). Of course, this picture could be biased by the actual stage of the available archaeological evidence. Future investigations can change this interpretation.

It is particularly interesting to compare the occurrence of different glyptic regional styles found in Kültepe's lower level II (ca. 1970-1835 BC) in the houses of the Anatolian merchant Peruwa and the Assyrian merchant Uṣur-ša-Ištar. A chi-squared test has been performed and the resulting p-value <0.001 indicates that glyptic regional styles and house's owner (Anatolian and Assyrian merchant) are significantly different (Fig. 92), with more international styles in the house of Uṣur-ša-Ištar, the Assyrian merchant was involved in trading activities spatially spanning from central Anatolia to Mesopotamia (Figs. 93 and 94). In contrast, the glyptic evidence from Peruwa's house suggests trade on a more local scale, with more seal/impressions belonging to Anatolian style (Figs. 93 and 94).

Indications about seals/impressions' regional styles are available for 2182 items coming from 29 sites distributed in central/south-eastern Anatolia, northern Syria and northern Mesopotamia (northern Iraq and Khabur Triangle). A chi-squared test (p-value <0.001) has been performed in order to assess if glyptic styles and their original distribution zones (Anatolia, Syria and northern Mesopotamia) are significantly associated (Fig. 95). In Syria and in northern Mesopotamia there are more than expected seals/impressions belonging to the Old Syrian and Old Babylonian styles (Figs. 95). This may indicate that both the Old Syrian and the Old Babylonian glyptic styles were mostly used in Northern Syria and Mesopotamia, two areas in which the dynasties of Amorite kings imposed their dominion. Instead, in Anatolia there are more than expected Anatolian and Old Assyrian glyptic styles (Fig. 95). This reflects the broad use of the local glyptic style in Anatolia, the intense commercial activity performed by the Assyrians merchants in the area through their colonies, but also the bias due to the available data. The percentage of different styles in each zone could also reveal long distance contacts between different regions (Fig. 97). It is quite striking how in Syria and in northern Mesopotamia the percentage of the occurrence of different glyptic styles match almost completely. In both areas the Old Syrian and Old Babylonian styles are highly represented, while rarer are the Old Assyrian and the Anatolian styles. The higher frequency of both Old Babylonian and Old Syrian glyptic styles in Syria and northern Mesopotamia could be explained as the consequence of tight political and trade contacts between the Amorite dynasties. Alternatively, the spatial distribution of Old Babylonian and Old Syrian style seals in the area could be related to the activities of Assyrian merchants who, as already said, owned also seals belonging to these two styles (see Larsen and Lassen 2014, 186-187; Lassen 2014, 116-118). In Anatolia, the highest percentage is represented by the local and the Old Assyrian styles, while less frequent are the Old Babylonian and the Old Syrian styles (Fig. 97). However, the occurrence of the Old Assyrian style in Anatolia is biased by the fact that most seals/impressions (1793 out of 2067) come from Kültepe's lower town (level II and Ib). This aspect does not exclude the importance of the Assyrian traders that were also involved in the internal market of copper and wool in Anatolia and, therefore, could have favoured the widespread of the Old Assyrian style in Anatolia

(Larsen and Lassen 2014, 177). Although the Old Syrian and Old Babylonian styles were less common (both around 10 %), their presence is due not only to long-distance contacts between the Anatolian rulers and the Amorite kings of Syria and Mesopotamia but also to the activities of Assyrian traders.

4.5.6 Discussion

The small number of publications with "archives" of seals published with their associated texts makes difficult inferring the diachronic and spatial development of sealing technology and styles in Upper Mesopotamia and central Anatolia in the early second millennium BC. In fact, the recent works by Lassen (2012 and 2014) and Topçuoğlu (2014) have pointed out the importance of analysing the seals in association with their textual context in order to link each seal to its owner and to detect patterns of cultural transmission of seal styles' traits between Anatolians and Assyrians. An analysis of seals with their associated textual contexts is outside the scope of the present study, where the available data have been just analysed in a spatial perspective and with an archaeological approach. Undoubtedly, this approach is problematic and does not allow me to detect clear phenomena of cultural transmission (e.g. hybridization, cultural drift, etc.) and interaction between different communities on a small scale and with a high chronological resolution, which an ideal overlap of texts and seals would make possible (see Larsen and Lassen 2014; Lassen 2014; Topçuoğlu 2014). In addition, the uneven chronological distribution of glyptic evidence (9 sites from MBI versus 28 sites from MBII) makes me analyse all available seals within the same broad time span (ca. 2000 – 1600 BC). With the above issues in mind, in this section I only provided broad patterns and general explanations of the spatial distribution of different regional styles in Upper Mesopotamia and central Anatolia.

An analysis on the clay objects bearing seal impressions shows that rolling a cylinder seal onto an envelope encasing tablets became the mainstream practice in the first centuries of the 2^{nd} millennium BC in Upper Mesopotamia and Anatolia, but afterwards was gradually replaced by direct sealing of tablets. In addition, it seems that the spread of the cylinder seal into Anatolia, a land with a long stamp-seal tradition, was promoted by the commercial activities of the Assyrians that encouraged locals to acquire and produce cylinder seals in the area (Teissier 1994, 54-55; Larsen and Lassen 2014, 179).

The only site which allows a clear chronological subdivision of the early second millennium is Kültepe's lower town with three distinct archaeological levels: level II (ca. 1970-1835 BC), level Ib (ca. 1835-17th c. BC), and level Ia (ca. 17th c. BC). In Kültepe's lower town 1617 seals/impression come from the level II, while just 162 from level Ib. Therefore, given the discrepancy of available data, comparing any kind of pattern (e.g. shapes, styles, sealing device, etc.) between these two archaeological periods could not provide reliable results. An overall analysis of the evidence from levels levels II and Ib reveals that most seals/impressions belong to the Anatolian and Old Assyrian styles. This aspect is not so surprising if we consider that almost all seals/impressions published from Kültepe come from the private contexts of the commercial quarter (lower town). So, the high frequency of seals/impressions belonging to the Anatolian and Old Assyrian styles can probably be associated directly with the trade activities of the Assyrian and the Anatolian merchants. With this tentative proposed link in mind, it is thus a pity that so few seals/impressions come from Kültepe's main mound because it would be useful to compare the frequency of different glyptic regional styles varies here versus lower town. Another problem to take into account when we analyse the seals/impressions styles at Kültepe is that the Anatolian cylinder seals were used by both Anatolians and Assyrians and, therefore, an unequivocal correlation between ethnicity and seals is not always possible (Larsen and Lassen 2014, 180, 186; Topçuoğlu 2014, 131-132). Even so, a statistical test performed on the glyptic assemblage from the houses of the Anatolian merchant Peruwa and the Assyrian merchant Uṣur-ša-Ištar has revealed a significant association between styles and house's owner and showed a more local trade network for Peruwa and a more international character for the trade activities carried out by Uṣur-ša-Ištar. Of course, stating that the Anatolian merchants were involved in a more local-oriented trade, while the Assyrians in a more international trade network is not strictly reliable on the basis of only one example, but given the political and economic circumstances occurring in Upper Mesopotamia and Anatolia during the Middle Bronze Age it is a worthwhile starting suggestion.

However, even if seals from Upper Mesopotamia and Anatolia were often locally made and employed by locals, they often still implied a wider context of long-distance contact in the sense that they were sometimes produced in exotic non-local materials and bore international iconographic motifs. The data have shown that there is a spatial association between the materials with which the seals have been produced and their distribution zones. What is evident is that seals were mostly produced with local raw materials without excluding the use of materials coming from far-off lands. In fact, the widespread use of haematite as a privileged raw material for producing seals is almost certainly ascribed to an intense activity of extraction and then distribution through a well-established commercial network of long-distance exchanges.

Despite the total lack of well documented and systematic studies reporting the intra-site spatial distribution of seal or seal impressions at a given site, it seems that the seals were used both in the private sphere relating to the commercial transactions and in the local palatial bureaucratic administration. In this framework, the spatial distribution and adoption of seals/impressions belonging to different regional styles over Upper Mesopotamia and central Anatolia suggests that each style was not used just locally and its spread was the result of intense long-distance contacts among Mesopotamian, Syrian, and Anatolian communities. The overlap of different glyptic styles over great distances shows the presence of different interlocking and intersecting commercial circuits and spheres of interaction among Near Eastern communities. Therefore, the widespread Old Assyrian style in Anatolia could have been fuelled by the network of commercial settlements set up by the Assyrians, while the distribution of both the Old Babylonian and the Old Syrian styles in Syria and Mesopotamia suggests a different circuit coterminous with the political and economic reach of the Amorite dynasties, and reinforced by ties of kinship, as well as political and commercial alliances.

4.6 Summary

In this chapter, I have explored the empirical evidence provided by specific types of material culture, such as Syrian bottles, Khabur ware, balance weights and seals that might have moved throughout Upper Mesopotamia and central Anatolia in the Middle Bronze Age (ca. 2000 – 1600 BC). In particular, the distribution and spread of these artefacts occurs in a political landscape that shifts from a peer-polity system of city-states in its early stage (ca. 2000 – 1800 BC) to a narrower set of territorial states in its later stage (ca. 1800 – 1600 BC).[18] Across these political borders operated long-distance and overlapping commercial circuits (Larsen 1987, 53). In fact, in addition to the well-known Old Assyrian trade system, other commercial circuits may have existed: the Ešnunna-Larsa-Susa triangle in southern Mesopotamia, the Dilmun-Indus valley network, and the Mari-Emar-Aleppo circuit in north-western Syria to name just the most obvious (Aubet 2013, 288). In this context, cities such Aššur and Mari acted as privileged commercial brokers between Anatolia and Mesopotamia, thanks to their respective geographical locations. It is important to point out that in a so structured system, any kind of crisis and destabilization of those centres involved in the trade network could have undermined long-distance exchanges. On the other hand, the overall system seems a quite flexible, with fluid and interchangeable relations among different polities capable of adapting to political change and economic demand (Aubet 2013, 288-289).

This chapter has characterised the extensive distribution of several key types of material culture in Upper Mesopotamia and central Anatolia. Despite the fragmentary status of the available data, an attempt has been made to test some hypotheses and answer some targeted research questions. It hardly needs to be emphasized that the distribution modalities for particular types of material culture proposed here may easily be made obsolete by publication and the finding of new artefacts, but at least general trends have been detected and new possible research lines indicated. Put simply, the existence of long-distance contacts, shared habits and distinctive economic strategies throughout Upper Mesopotamia and central Anatolia is demonstrated by the spatial distribution of those artefacts. They suggest a similar appreciation of fine perfumed oils or ointment (Syrian bottles), a similar taste for a particular daily-life commodity (Khabur Ware), and administrative technologies (balance weights and seals). In sum, this range of different material culture classes show different spheres

[18] Examples of territorial states in the Middle Bronze Age II (ca. 1800 – 1600 BC) are Šamši-Adad I's kingdom, Mari, Qatna and Yamkhad in Upper Mesopotamia and north-western Syria and Anitta's kingdom in central Anatolia).

of interaction in Upper Mesopotamia and central Anatolia that could have been fuelled by the activities of traders involved in competing and interlocking commercial circuits (e.g. Assyrian merchants), but constrained by the presence of territorial states imposing their dominion over a large territory (e.g. Šamši Adad I's kingdom, Mari, Yamkhad, etc.) or simply by the mutual relationships between polities sharing the same kinship ties and/or political interests (e.g. Amorite dynasties in Syria and Mesopotamia).

Chapter 5

Models of Settlement Hierarchy

5.1 Introduction

This chapter aims to understand regional settlement systems through the study of both the physical and textual evidence yielded by archaeological excavations and regional surveys. In the Middle Bronze Age (ca. 2000-1600 BC), large settlements arose in Upper Mesopotamia and central Anatolia. The distribution of settlement sizes in these regions was relatively broad; numerous small and medium sized sites arose, while only a few sites became very large. These settlement systems were sometimes integrated within large states, while at other times the region was politically fragmented. In particular, both the overall character of early urbanism and different categories of political units (e.g. chiefdoms, cities, city-states, territorial states, and empires) have often been studied via a regional landscape perspective, most commonly by making use of archaeological surveys (see Wilkinson 2000 and Kowalewski 2008 for a broad review). Hence, archaeological surveys have been a valuable tool for archaeologists and have allowed them to address particular targeted research questions that are beyond the scope of single site excavations. The pioneering surveys of the 20th century directed by Braidwood (1937), Jacobsen (1958), and Adams (1965 and 1981) focused on the upper end of settlement hierarchy, in the form of the largest mounds, while largely neglecting smaller sites. It has long been known however that such an approach provides a rather misleading picture of settlement systems occurring in a given area, particularly for less urbanized phases. The challenge for settlement survey archaeologists is, therefore, both to provide a coverage that is extensive enough to discern significant regional spatial patterning whilst at the same time increasing survey intensity in order to detect and locate smaller sites. More recently, archaeologists have met this latter challenge by increasingly adopting an intensive fieldwork approach (e.g. Ristvet 2005; Wright *et al.* 2006-2007; Ur and Wilkinson 2008; Ur 2010b) and by employing remote sensing datasets such as satellite imagery (see Ur 2003 and 2013; Altaweel 2005; Wilkinson *et al.* 2005; Menze *et al.* 2006; Menze and Ur 2012; Casana and Jackson 2013). [19]

Archaeological survey data can be analysed via a broad range of approaches and methods. Recently, digital technologies have been particularly heavily used for the documentation, management and representation of archaeological survey data, with Geographical Information Systems (GIS) being an increasingly popular and powerful tool for the organisation and the visualisation of archaeological data alongside other spatial information. In contrast, less attention has been paid in recent years to the application of spatial statistics for detecting specific patterns in such datasets. Taking a step back, distribution maps have been widely used by archaeologists for many decades, but primarily just as accessories to embellish publications. It is correspondingly easy therefore to adopt uncritical and intuitive readings of those maps and it might be argued that the lack of a rigorous scientific methodology has so far undermined our opportunities to make sense of such datasets. Recently, however, GIS has been used by archaeologists not only for data management, but also for analysing data. Furthermore, In the past decade, there has been a renewed interest in the application of spatial statistics techniques to archaeology (see Ladefoged and Pearson 2000; Premo 2004; Bevan and Conolly 2006; Conolly and Lake 2006; Crema et al. 2010; Bevan 2012; Bevan *et al.* 2013; Palmisano 2013; Li *et al.* 2014).

In addition, the broader spatial analytical frameworks usually adopted such as *central place theory* and the *Thiessen polygons,* for detecting settlement patterns of state-level societies are often questionable and not reliable as originally proposed. For instance, the occurrence in the Eastern Khabur triangle of seven large sites, having an extent between 20 and 100 hectares, located less than 20 km of distance from each

[19] Recently, the most used data sources in the upper Mesopotamian region are CORONA satellite images. The CORONA satellite program, in operation from 1959 to 1970, was launched by the American intelligence with the purpose of monitoring sensitive strategic areas by spy-satellites. The declassification of U.S. Corona satellite images by the U. S. government in 1995 and consequently their open dissemination to any user without expensive prices (about $30 per scene), the high resolution of these images (2 metres), the almost total coverage of western Asia, make this kind of data an essential tool for the scholars dealing with landscape Archaeology in the Near East.

other, contradicts the hexagonal lattice patterns predicted by central place theory (Ristvet 2008, 585). The standard model of Thiessen polygons also does not consider the size and the hierarchical rank of the settlements: a small site can be related to a polygon having the same extent of another polygon belonging to a big site (Wilkinson and Tucker 1995, fig. 41). Another basic assumption commonly accepted by archaeologists dealing with political landscapes is that the territories, for instance, of Mesopotamian kingdoms, were characterized by contiguous and well-defined borders. That assumption may be true in specific landscapes characterized by marked topographical features (for instance rivers, mountains, etc.) but in other areas such as the Khabur triangle, which is largely a plain, the political entities may have had unstable and contested territories (Eidem 2000: 257).

Recently, Ristvet (2008, 597-598) and Kantner (2008, 41-42) have also pointed out that archaeological survey data alone do not allow scholars to model ancient political and economic landscapes if they are not also contextualised via other archaeological and/or historical evidence. Below I therefore look to integrate and calibrate the archaeological and spatial data against textual evidence in order to have a better and complete understanding of the economic and political geography in Upper Mesopotamia and central Anatolia in the early second millennium BC (*ca*. 2000-1600 BC).

This chapter begins by providing background information and data on two case study regions: central Anatolia and the Khabur triangle. It starts with an outline of the limitations and potential of the archaeological surveys carried out in those areas. Then, settlement pattern and rank-size analysis will be performed in order to understand the settlement systems occurring in the Khabur Triangle and Central Anatolia in the Middle Bronze Age. In section 5.3, I will discuss the methodological aspects of rank-size analysis as they impact on the different observed distributions. Finally, in the section 5.4 I will introduce and explain the methodology of spatial interaction modelling and structural dynamics approaches to provide explanations that address what factors make locations attractive for trade and settlement, and affect settlement growth and change. Hence, I will explore why some sites become important settlements, whilst others diminish in the period discussed. I will assess how political and geographic constraints affect regional settlement transformations, while also accounting for uncertainty in the archaeological data.

5.2 Natural and human landscapes

5.2.1 Case studies

For the purpose of this project two different well-defined sub-regions within my research area have been chosen (Fig. 97).

The first case study is the Khabur Triangle, an area located within the Syrian Jazira, measuring some 37,480 km^2 and extending between the Tigris and Euphrates rivers, bounded by what is today the Syrian/Iraqi border to the east, the Syrian and Turkish border to the north, the Jebel Sinjar and by the Jebel ‘Abd-al-Aziz to the south and the Khabur River to the west (Fig. 97a). The second case study is central Anatolia, a region covering a total area of about 200,000 km^2 between the Pontic Mountains to the north and the Taurus mountains to the south (Fig. 97b). The Kızılırmak River also divides the Central Anatolian plateau into a northern and a southern part. The area located within the bend of the river is a rich and fertile land, while to the west and south of the river land it is drier.

The choice of the two areas has been stimulated by an interest in how different geographical settings (an open tableland versus a mountainous inland area with a large intermountain river valley) contributed to the development of local settlement systems. The selection has also been influenced by the limited number of regions where a sufficiently high intensity of archaeological excavations and surveys has been conducted and by the need to provide a coherent framework for the settlement systems analysed, given several gaps in the survey record over Upper Mesopotamia and central Anatolia for the Middle Bronze Age (ca. 2000-1600 BC). The two areas, however, should not be viewed as fully isolated from each other as testified by the long-distance commercial system set up by the Assyrians in the early second millennium, if not before. Understanding the settlement systems occurring in central Anatolia and Khabur Triangle during the early second millennium is of pivotal importance, as both areas were divided into several city-states and local monarchies hosting Old Assyrian commercial colonies (Barjamovic 2011a, 6). Furthermore, the second one became criss-crossed by long-distance commercial routes from Aššur to central Anatolia (Goetze 1953; Hallo 1964; Oguchi 1999 and Kolinski 2014 for a broad overview) and was characterized by the presence of Šubat-Enlil/Šehna (Tell Leilan), the capital city of Šamši-Adad I's kingdom (see Eidem 2008, 32; Ristvet 2008).

5.2.1.1 The Khabur Triangle

The Upper Khabur basin is an alluvial plain filled with rocks and sediments during the Tertiary and Quaternary periods. The dominant soil in the area is very fertile (a calcic aerosol, Wilkinson and Tucker 1995: 5-6). This area is characterized by a seasonal Mediterranean climate, with the rainfall mainly occurring during the winter months. The annual amount of precipitation throughout the basin varies according to the latitude, so that the quantity of rainfall declines as one moves southward (FAO 1966: 52-57; see Fig. 98). These averages can annually vary by 20/30 percent and can strongly affect the settlement patterns in the area if we consider that a threshold of 250 mm precipitation isohyet is generally accepted by scholars as the minimum for a successful crop in a dry-farming agriculture (Ur 2010b, 10-11). The use of this modern rainfall data as proxy reflecting the past climate conditions in the area is still an openly debated matter. Some scholars have proposed that fourth and third millennia were wetter than the present (Hole 1997; Deckers and Riehl 2007), while the second half of the third millennium BC witnessed a drying phase causing the collapse of settlements, not just in the Upper Khabur basin, but also throughout the eastern Mediterranean and the Near East (Weiss *et al.* 1993; Bar-Matthews *et al.* 1999; Weiss 2002).

Archaeological excavations and surface surveys carried out across the KT provide the bulk of data about the spatial location and extent of settlement at both regional and local scales, as well as about settlement occupation histories. While at times such data can be problematic, as sites are obscured from the archaeological record or are simply undetected, considering the scale of the area studied, many sites have been detected because they are mounds that protrude above the rest of the ground surface. In the Khabur Triangle, relevant survey data include: Meijer (1986), Eidem and Warburton

(1996), Lyonnet (2000), Ristvet (2005), Wright et al. (2007), Ur and Wilkinson (2008), and Ur (2010; see Figs. 99 and 100 for a list of surveys carried out in the Khabur Triangle). Other nearby surveys (Algaze, 1989; Wilkinson and Tucker, 1995; Ball, 2003) have been left out of the analysis, as these are not as contiguous as the others. Within the Khabur Triangle, there are 439 sites that were occupied during the MBA (Fig. 101). In the eastern Khabur Triangle, the Tell Leilan (Ristvet, 2005) area alone has 157 sites during the MBA. Here, the dominant role of Tell Leilan is clear, which had an area of ca. 90 ha with many surrounding small satellite villages. The dense concentration of settlements around Tell Leilan may be related to its prominent political role as the capital city of Šamši-Adad I's large territorial kingdom (ca. 1808-1776 BC), and later as the main town of the kingdom of Apum (second half of the 18th century; Charpin 1987; Ristvet 2008). Other major centres include Tell Farfara (ca. 70 ha) and Tell Muhammed Diyab (ca. 35 ha). Along the Wadi Jaghjagh, the main settlements were Tell Brak (ca. 25 ha) and Tell Barri (ca. 9 ha). The long-term political significance of this region may have brought a sort of political stability and security that encouraged dispersed small-scale settlement. In the western KT (i.e., west of the Jaghjagh River), settlements are nucleated and populations were likely concentrated in towns such as Chagar Bazar (ca. 9 ha), Tell Mozan (ca. 35 ha), and Tell Arbid (ca. 7 ha), with the surrounding territory largely devoid of smaller settlements. This suggests that populations were concentrated in few bigger towns surrounded by plains empty of villages, but full of nomads (Ristvet 2012; Ristvet and Weiss 2013, 263-265). Overall, far more settlements and greater diversity of site sizes are found in the east; this could be because the area had more favourable climatic conditions (Evans and Smith, 2006).

5.2.1.2 Central Anatolia

The Anatolian plateau may be divided into several different areas, each one with its own well defined characteristics and resources. The main and most densely populated area is the central part of the plateau, which has an extent of about 200,000 km^2 between the Pontic Mountains to the north and the Taurus mountains to the south. The Kızılırmak River plays as a natural border dividing the central Anatolian plateau into a northern and a southern part. Researchers have proposed that the two millennia prior to the early second millennium were largely relatively wet, but a drying trend may have started in the late third millennium throughout the eastern Mediterranean (Weiss *et al.* 1993; Bar-Matthews *et al.* 1999; Weiss 2002; Smith 2005; Kuzucuoğlu and Marro 2007). There is little research on this topic in Anatolia, but some recent works have shown a clear record of severe droughts occurring in the late third millennium in the Konya plain and in the Sivas region (Boyer *et al.* 2006; Kuzucuoğlu *et al.* 2011). However, in the early second millennium BC more favourable environmental conditions may have allowed major late Early Bronze Age urban centres (e.g. Acemhöyük, Beycesultan, Kültepe) to re-emerge as new city-states (cf. Bottema and Woldring 1990, 243-246; Yakar 2000, 17-18; Massa 2014, 115).

Archaeological excavations and regional surveys carried out in central Anatolia by Turkish and foreign teams have provided a large amount of data. Regional surveys, in particular, have produced the largest body of data on size locations and sizes as well as about periods of occupation (see Fig. 102[20] and Fig. 103 for a list of surveys carried out in central Anatolia). Within central Anatolia there are 440 sites that were occupied during the Old Assyrian Colony Period (ca. 1970-1700 BC; Fig. 103). Other nearby archaeological surveys have been left out of the analysis because these are not as continuous with the others and there are gaps in the archaeological dataset. The settlement system in the Anatolian central plateau is characterized by few large sites such as Kültepe (ca. 50 ha), Acemhöyük (ca. 55 ha), Bögazköy (ca. 65 ha), Yassihöyük (ca. 25 ha), Varavan Höyük (ca. 25 ha), and Alişar Höyük (ca. 20 ha), with many surrounding small settlements.[21]

5.2.2 The properties and limitations of archaeological survey data

Before proceeding to illustrate the most suitable tools for detecting clumped and dispersed patterns and settlement hierarchies, it is important to highlight some of the limitations in the applicability of most spatial analyses in archaeological survey data. Interpreting archaeological surveys is not always straightforward and many studies

[20] The map shows only the archaeological surveys yielding Middle Bronze Age sites and covering the study area of the present doctoral project. For a complete list of archaeological surveys over all Anatolia see Barjamovic 2011a, 75-76, map 5.

[21] The extents of the sites are just rough estimates based on the sizes of their mounds. Intensive archaeological surveys of the presumed lower town surrounding a mound have never been carried out in Anatolia.

have pointed out the problems related to surface data collection in terms of number of sites, as well as occupation period and size (cf. Redman 1982; Wilkinson 2000; Banning 2002). These difficulties derive from the fact that the character of particular surface collections may have been shaped by a wide variety of natural and cultural taphonomic processes (e.g. agriculture, erosion, floods, human and animal excavations, wind deflation, etc.; cf. Roper 1976, 372; Hirth 1978, 125; Ammerman 1985, 33; Gregg *et al.* 1991; Brantingham *et al.* 2007). There are at least four different issues worth raising with respect to uncertainty in archaeological survey data.

First, there is a commonly accepted assumption that the assemblage visible on the ground surface is adequate evidence for the underlying archaeology at a site. Nevertheless, not necessarily all archaeological periods present somewhere within a settlement mound are equally represented on its surface, due to a series of factors: the surface assemblage may be subject to post-depositional and erosion events; potsherds belonging to earlier periods may be underrepresented in comparison to the ones belonging to later periods; there may exist a preference amongst individual surveyors to pick up more visible and larger potsherds. In addition, in order to provide reliable estimates of site-size for each period, the surface of a site should be divided into several sub-areas so that it is possible to detect shifting patterns of occupation across time and space. It is important to point out that in this kind of investigation, the density and spatial distribution of surface data could be biased by the geomorphology of the site itself such as erosional processes removing sediments and artefacts from a high central mound and depositing them on the slopes adjacent to it and/or on the surrounding lower town (see Rosen 1986, 31-33; Wilkinson *et al.* 2001; Wilkinson 2002, 95-99; Ur *et al.* 2007).

Second, spatial uncertainty is derived from ambiguities and fuzziness in the definition of the spatial unit of analysis, which could be related to the size and the boundaries of a given site both in an intra-site and regional scale of analysis (Cherry 1983, 387; Wandsnider 1998). The main issue is that we commonly rely on spatial units that are the result, on the basis of spatial proximity rules, of the aggregation of atomic components such as dwellings for settlements and artefacts for sites (Gallant 1986, 416). For example, settlements are living communities as “group of persons who normally reside in face-to-face association” (Murdock 1949). More recently, Ur (2010, 59) uses the term site to refer to “the place as it exists at present”, and settlement as “a living social and economic entity in the past”. Traditionally, in the archaeology of Near East the term site has been considered too obvious to require any definition, and it has been generally equated with tell. Instead, recent intensive archaeological surveys have revealed that tells are just one of several site morphologies, and not even the most common (Wilkinson 2003). In addition, in some cases it is extremely difficult to assess if smaller sites are to be interpreted as temporary camp-sites and agricultural stations or as permanent sedentary settlements (cf. Horne 1993, 47). The fuzzy nature of the definitions provided and the ambiguity of the equation “site=settlement” offers an example of how it is problematic defining a spatial unit of analysis, with consequences that may affect the analytical and interpretative phases of the research. In fact, sites do not only refer to places of dwelling, but they also indicate temporary activity areas (e.g. camp sites), industrial areas (mines), and cemeteries. Nevertheless, for the purposes of this chapter, aiming to detect settlement patterns and hierarchies in those study areas defined above, I will synonymously use the term sites and settlements to refer exclusively to places of human habitation.

Third, without the support of stratigraphic data from excavations, sites’ occupation periods can be only established on the basis of the chronological resolution of a given pottery type. For instance, if the surface of a given site has yielded a particular pottery type dated to a timespan of a century, the century becomes the smallest chronological unit possible within which the occupation period of the site can be assigned. Pottery, as the most abundant evidence in archaeological surveys collection, is generally used as chronological marker and dated according to stylistic variation. This implies the imposition of a phase-based chronology upon culture change and the assumption that that cultural change is step-wise rather than continuous (Plog and Hantman 1990; Wossink 2009, 48-49). For example, in the Khabur Triangle, surveyed sites have been commonly dated to the Middle Bronze Age (ca. 2000-1600 BC) by using Khabur Ware as a chronological marker. The problem with this diagnostic pottery is that, on the basis of small potsherds collected from surface, the “Early” (phases 1-2: ca. 2000-

1750/30 BC) and "Late" (phases 3-4: ca. 1750/30-1400 BC; see Oguchi 2006 for this periodization) versions of Khabur Ware are difficult to distinguish archaeologically. In north/central Anatolia the conservative aspect of the pottery assemblage of second millennium BC makes any dating from surface collection possible in only very broad terms (cf. Schoop 2003, 168; Glatz *et al.* 2009, 108-110). The integration of particular vessel types with a quantitative approach has allowed researchers to divide the second millennium into early, middle and late phases (see Fischer 1963, 67; Neve 1984; Kull 1988; Schoop 2006 and 2009).[22] The early phase comprises broadly the Old Assyrian Colony period or Middle Bronze Age (ca. 2000-1600 BC). Hence, when we analyse the sites dated on the basis of these long-living pottery types, we should take into account that the available picture may be biased. The assumption that sites dated to the same archaeological phase are contemporaneous may be false if we take into account that sites may have been occupied for a shorter period of time within a phase, and not during the whole phase. One solution to the problems raised above is to improve the chronological resolution of the phasing wherever possible. A further step in the right direction would also be to integrate textual evidence and stratified archaeological materials with radiocarbon dating or other dating methods.

The fourth and final issue is that sampling and data collection strategies of archaeological surveys may affect the interpretations and results made from them (Banning 2002; Schiffer *et al.* 1978). Several authors have discussed the implication of probabilistic sampling in terms of ensuring that the sample selected is representative of the whole (Shennan 1997, 362; see Orton 2000 for a broad overview about methods). Probabilistic sampling have been commonly adopted in archaeological surveys carried out in countries characterised by a temperate climate such as Europe and northern America, where both visibility and site obtrusiveness are quite low, and so a sampling approach allows smaller areas to be investigated at a high intensity (Plog *et al.* 1978). On the other hand, the arid or semi-arid climates of the Near East, and millennia of timber clearance, heavy agriculture, and overgrazing, have favoured conditions of high site visibility and obtrusiveness, so that sampling has not been

[22] The proportion of red to brown slipped vessels is much higher in the early second millennium than during the Old Hittite and Hittite empire period (Late Bronze Age, ca. 1600-1200 BC). Hence, the reduction of decorative slips appears to cross-cut the division between the Old Assyrian Colony period (mainly MBA, ca. 2000-1600 BC) and the Old Hittite periods (Schoop 2009, 150-152).

considered as necessary (Ur 2010b, 49). The main advantage of such a 'full' coverage approach versus a sampling strategy is that it provides a more complete hierarchical size-range settlement system (Summer 1990). Nevertheless, the weakness of a full coverage regional approach is that smaller, non-mounded sites, such as seasonal pastoral campsites are inevitably been underrepresented. Hence, several recent archaeological survey projects have included a system of transect-walking samples to detect less visible archaeological evidence in the landscape (cf. Wilkinson and Tucker, 1995; Ur 2004; Wright *et al.* 2006-2007; Wilkinson and Ur 2008; Matthews and Glatz 2009; Ur 2010b). There is also discussion about the degree to which the boundaries of a survey area may affect the nature of the results and interpretations drawn from them (see Schiffer *et al.* 1978; Plog *et al.* 1978; Banning 2002, 22-25). Some archaeologists have stated that an arbitrarily defined survey universe is not worth studying (Plog *et al.* 1978, 384). However, this assumption is problematic in the Near East, where the boundaries of survey areas are particularly sensitive to political issues or defined by local antiquities officials rather than by archaeologists for archaeological purposes. Furthermore, in archaeology it is nearly impossible to design survey areas that encompass whole unitary political entities and settlement systems as they change through time and, for instance, a particular whole kingdom in a given period may be part of a larger political entity in another period (Ur 2010b, 42).

Unfortunately, the history of landscape studies in the Khabur Triangle and in central Anatolia has developed different and far less coordinated methods. In the Khabur Triangle early archaeological surveys were extensive (see Meijer 1986; Lyonnet 2000), and only recently they have become more intensive and focused on the hinterlands of excavated big sites such as Hamoukar (Ur 2010b), Tell Beydar (Ur and Wilkinson 2008), Tell Leilan (Ristvet 2005), and Tell Brak (Eidem and Warburton 1996; Wright *et al.* 2006-2007; see Figs. 99 and 100). In central Anatolia, the archaeological surveys have been mostly extensive and just a few have been intensively carried out in the Konya Plain (Baird 1996-2002), in Paphlagonia (Matthews and Glatz 2009), in Gordion (Kealhofer 2005), in the Lower Euphrates basin (Özdoğan 1977), and around Boğazköy (Czichon 1997, 1998 and 2000). Survey intensity can be understood as the amount of effort expended on a given spatial unit, and is generally inversely proportional to the size of the investigation area (Plog *et al.* 1978; Cherry 1983, 391; Summer 1990). In fact, a simple linear regression analysis on the archaeological surveys carried out in the Khabur Triangle and central Anatolia shows a significant negative correlation between sites density and survey area's size (R^2= 0.75, Fig. 105). Hence, when the survey area increases, the sites density decreases (Fig. 106). In addition, the archaeological surveys in the Khabur Triangle and in central Anatolia strongly differ in intensity. In fact, a ranking of all archaeological surveys carried out in both study areas shows higher sites density values for the surveys carried out in the Khabur Triangle (Fig. 107). The table (Fig. 107) shows that just eight archaeological surveys have a sites density higher than 10 sites per 100 square kilometres. Among them, only two surveys are from central Anatolia (Ozdoğan 1977; Kealhofer 2005). Such low–intensity methods have the advantage of recovering relatively quickly larger settlements, but they are more prone to miss smaller sites (Redman 1982, 377-378). This approach provides poorer recovery rates for small settlements, and strongly skews our understanding of settlement hierarchies in early complex societies. Consequently, the need to have a more complete and deep understanding of settlement systems in a given study area has increased the intensity degree of Near Eastern surveys. In the Khabur Triangle the extremely favourable conditions of site visibility and obtrusiveness allow archaeologists to reach acceptable levels of intensity by making use of remote sensing data (e.g. CORONA satellite imagery) without necessarily adopting pedestrian transects (Ur 2010b, 40-41).[23] What is interesting to notice is that the eastern Khabur Triangle shows higher site density than the western Khabur Triangle. This aspect could be a reflection of ancient settlement strategies, but it could be also biased by the intensity of the archaeological surveys carried out in the area. In fact, just two archaeological surveys have been carried out in the western Khabur Triangle (Lyonnet 2000; Ur and Wilkinson 2008) and they strongly differ in terms of site density (18.28 sites x 100 sq. km of Ur and Wilkinson 2008 versus 3.15 sites x 100 sq. km of Lyonnet 2000). Therefore, the overall picture of the Khabur Triangle, in terms of site density, could be distorted by the different methodologies of the archaeological surveys carried out. On the other hand, what is undoubtedly evident is that in the eastern Khabur Triangle there are more and larger settlements than in its western part.

[23] In the archaeological survey carried out around Tell Hamoukar all sites detected in almost 80 km of walking transects had already been identified from satellite imagery.

In central Anatolia, a lower site visibility and obtrusiveness, when compared with the Khabur Triangle situation, might, perhaps should, have made the adoption of walking transects a necessity. Instead, the vast majority of archaeological surveys carried out in central Anatolia fall within the “extensive" category and we have just a few examples of regional investigations undertaken by using walking transects (see Matthews and Glatz 2009). In fact, site densities from surveys carried out in central Anatolia (see Figs. 105-107) are far lower (ranges from 0.4 to 5 sites per 100 sq. km.) than those recorded in systematic and extensive regional surveys performed in Upper Mesopotamia (around 10 or more sites per 100 sq. km; e.g. Wilkinson and Tucker 1995; Ristvet 2005; Ur and Wilkinson 2008; Ur 2010b) or in other parts of Anatolia (range from 6 to 10 sites per sq. km.; e.g. Boyer et al. 2006; Abay 2011) . In addition, existing publications indicate just the overall extent of mounds but neither the size for a particular chronological phase nor the extent of the surrounding lower town.[24] Therefore, we can provide only very rough estimates about the empirical extent of Middle Bronze Age sites in central Anatolia, and any results derived from the analyses of the archaeological survey data have to be interpreted cautiously, as constituting evidence only about the patterns exhibited by relatively large, sedentary farming communities. Topographic variability is another issue to be considered in the Anatolian context. Central Anatolia is characterized by lowland areas, high intermountain valleys and plateaus framed by the Pontic Mountain and the Taurus ranges, which respectively reach up to ca. 3,000 and 3,700 meters above sea level. Mountainous fringes and areas with rugged topography are marginal zones that have not commonly received as detailed archaeological attention as lowland areas for a series of practical reasons such as difficult terrain and dense vegetation cover (see Banning 1996; Wilkinson 2003, 185). In central Anatolia there is just one example of an archaeological survey including higher-altitude landscapes in its investigations (see Matthews and Glatz 2009). In addition, recent archaeological surveys have preferred to continue with extensive pan-regional methodologies rather than focus on those hinterlands around large excavated sites that played a pivotal role as political and economic centres in the past. Therefore,

[24] See Wright *et al.* (2006-2007), Ur et al. (2007), Ur and Wilkinson (2008), Ur (2010), and Abay (2011) for the potential of intensive survey around mounds to understand expansion and contraction of settlement size in different periods.

prevailing research strategies in central Anatolia are to some extent to blame for the difficulties in the recognition of low-tiered settlement hierarchies in periods of social complexity.

In the end, it is important to point out that any attempt to interpret archaeological survey data has to consider at least two aspects: the possibility that the sites detected may represent just a proportion of the totality of archaeological sites existing in the past within a given survey area; the surface data collection do not necessarily represent the variety of materials and occupation periods present at a given surveyed location. However, despite their limitations, archaeological survey data represent the most important available evidence for any regional population-led analysis and provide a contextualized framework for the archaeological sites excavated in my study areas.

5.3 Settlement Rank-Size Distributions

As I have previously stated in this chapter, the detection of specific settlement patterns in a specific area cannot be reduced to a visual representation of simple distribution maps, but also needs to involve inferential spatial statistics. Then, the use of models and analytical techniques are necessary for testing hypotheses and for detecting significant patterns. In this section, I will adopt and extend a long-established technique known as rank-size analysis to detect particular settlement patterns in the Khabur Triangle and in central Anatolia. This analysis respectively uses the estimated sizes of 439 sites surveyed in the Khabur Triangle (Fig. 101) and of 440 sites surveyed in central Anatolia (Fig. 104).

5.3.1 Methodology

Rank-size distributions have been considered in archaeology for studying regional settlement patterns for over 40 years (e.g. Johnson 1972, 1977 and 1980; Blanton 1976; Crumley 1976; Pearson 1980; Adams 1981; Kowalewski 1982; Paynter 1982). The "rank-size" rule was originally presented by Auerbach (1913), who observed that "the cities of modern industrial nations, when ranked according to their population, are distributed such that the largest city is twice the population of the second-ranked city, three times the population of the third-ranked city and so on". According to this rule, in a given settlement system the size of the *n*th-ranked site is predicted by dividing the size of the largest settlement by its own rank. Therefore, in a settlement system whose largest site is 12 ha, the rank 2 settlement would be 6 ha, the rank 3 settlement 4 ha, and so on. Zipf (1949) theorised that the rank-size relationship was the result of two different forces: a "Force of Unification", which encourages settlement aggregation and a "Force of Diversification", which defines settlement dispersion (Savage 1997). When they are in balance, the various settlements conform to the rank-size rule. Zipf (1949) expressed this rule with the following formula:

$$P = K\ x\ r^{-q} \tag{1}$$

where the size of a given observation (*P*) can be predicted if its rank *r*, the size of the largest observation (*K*), and the constant *q* are known. When *q* is greater than 1, we have settlement systems characterised by a few large dominant centres, while when *q* is lower than 1, the settlement system is less integrated and a more uniform distribution of sizes can be observed. Instead, when these forces of unification and diversification are in equilibrium, *q* will be equal to 1 and we will have a so-called 'Zipf's Law' of settlement size distribution. For graphical simplicity rank-size graphs are usually plotted on a log-log scale, so that expected rank-size rule (Zipf's Law) results in a straight line from the upper left to the lower right corner of the plot (Fig. 108).

In archaeology, the distributions of settlement size often do not conform to the rank-size rule and plotted settlement size distributions can be steeper (*primate distribution*) or shallower (*convex distribution*) than the Zipf's Law (Fig. 108). However, these deviations from the expected rank-size rule usually do not follow a straight-line, and in some cases the force of unification and diversification act at different rank levels, resulting in a mixed and non-linear relationship between rank and size. Hence, researchers have also introduced the idea of *primo-convex* distributions when respectively at higher and lower ranks a primate and convex pattern are evident or even *double-convex* distributions when two convex patterns are evident at different rank levels (see Fig. 108; Falconer and Savage 1995, 39-41; Savage 1997, 234).

A wide range of explanations have been proposed for interpreting those types of rank-size distribution that differ from Zipf's Law (for a summary of the explanations provided for various rank-size outcomes see Savage 1997, table 1). *Primate* distributions imply that in a settlement system there are one or only a very few large centres and a higher number of smaller settlements. This could indicate strong vertical integration and unusual centralization of political and economic functions exerted by a dominant centre over many others (Johnson 1977; Kowalewski 1982, 65). By contrast, in a *convex* distribution there are many large settlements of roughly the same size in proportion to the number of small settlements. This could indicate population dispersion throughout a given area in sites that are of similar size and thus more competition and less integration between communities (Johnson 1980; Paynter 1982; Wossink 2009, 63-64). On the other hand, there can be other interpretations of such patterns. For instance, limited conflict encourages more widespread settlement and movement, while concentrated settlement could occur due to conflict. In addition, convex distributions are often the result of pooling more than one settlement system in the same analysis and consequently convexity indicates the existence of several independent communities. In yet another attempt at rank-size interpretation, some have argued that a convex distribution may result in a stepwise ranking, which may reflect a central place settlement system where highest-order large sites of equivalent political-economic function are equivalent in size (see Crumley 1976; Johnson 1977; Falconer and Savage 1995, 40-41). The primo-convex distribution could indicate the contemporaneous presence of two distinct settlement systems in a region: a centralized system (the primate upper distribution) superimposed on a lower level system loosely integrated or central place organization (the convex lower curve) (Falconer and Savage 1995, 41). The double-convex distribution indicates multiple settlement systems operating on two different rank levels within a single region (Falconer and Savage 1995, 52).

Archaeologists must be particularly careful when applying rank-size analysis to a given study area. It is most profitable when the spatial extent of a specific settlement system is known. In contrast, failure to identify its boundaries can heavily distort the results.

This is a problem for archaeologists, who often deal with data from arbitrarily defined region. In fact, defining exactly the boundaries of a settlement system in a given period is potentially a fruitless task, and the observed settlement patterns in a specific region should be considered only as a sample of larger spatial systems. It is therefore very likely that pooling more than one settlement system in the same analysis will result in convex settlement size distributions (Johnson 1977, 498). Drennan and Peterson (2004, 535-539) have emphasized this problem by comparing the results of rank-size analyses obtained with sample blocks of four different sizes. The results show that smaller sample blocks are the least convex, while larger blocks result in increasingly convex rank-size curves. Therefore, it is rather clear how samples of different size can determine settlement patterns occurring at different spatial scales of the analysis. Put simply, the larger the window of analysis the higher the chance of pooling more than one settlement system and then obtaining more convex rank-size curves. With these premises in mind, researchers must be aware of spatial patterning at different scales and possibly break down a larger original study area into smaller window analyses in order to detect how settlements patterns change at the local level.

Several authors have used basic statistical analysis to test the significance of deviations from Zipf's law in observed settlement size distributions (cf. Falconer and Savage 1995; Savage 1997). Drennan and Peterson (2004), instead of using K-S tests and/or Monte Carlo sampling, introduced a useful summary statistic in this regard. They propose an *A*-coefficient, which calculates the area of the shape of the rank-size curve above and below a standardised log-log plot (see also Crema 2013 and 2014 for the application of this method). This can be achieved by first scaling the rank–size plot, so that the plot has a square shape and the Zipf's law is the diagonal cutting the square into two parts of equal size (Fig. 109). In this way, the *A* value represents the portion of the shaded area between the Zipf's law line and the observed rank-size curve (see Fig. 109). Hence, the area above the Zipf's law curve and below the observed rank-size curve (A_1) will have positive values (Fig. 109), and then the area below the Zipf's law curve and above the empirical data (A_2) will have negative values (Fig. 109). Notice that the maximum value for A_1 is by definition 1, while A_2 could exceed -1 for strongly primate systems where one or more observed settlements are smaller than the expected smallest settlement predicted by the Zipf's law. According to this method, convex settlement size distributions will have positive *A* values (Fig. 110b), while primate curves have negative *A* values (Fig. 110c). Even though, the *A* values are useful to assess quantitatively convex and primate curves, they do not provide any information about the shape of the observed settlement size distributions because different rank-size curves can produce similar *A* values. This is the case of a primo-convex size distribution, where the difference between the positive A_1 values of a convex curve and the negative A_2 values of a primate curve can produce an overall *A* value close to 0. Therefore, the calculation of *A* coefficient must always be combined with the visual inspection of the size distribution.

Because Drennan and Peterson noticed that the *A*-coefficient is strongly affected by the sampling frame, they suggested use of a bootstrap statistical technique to test the statistical significance of the *A* values (Drennan and Peterson 2004, 539-543). This technique calculates the confidence interval of *A* values by resampling with replacement the observed settlement sizes with 1000 samples randomly selected. Each sample draws the same number of settlement observations as the original observed dataset, but duplicates the result of some observations, while others are omitted. For each of the 1000 samples, the resulting *A*-coefficient is calculated and readjusted in order to produce a confidence range within the *A* value of the original size distribution will probably fall. The resulting distribution is not always normally shaped, and thus a quantile-based definition of the 95 % confidence interval should be used. If the confidence interval is narrow, it is very likely that the observed pattern depicts a good picture of the reality. On the other hand, if the confidence interval is wide, we have to recognise that the observed pattern provides just a fuzzy picture of its real dynamic.

5.3.2 Results

Bearing in mind the above challenges, an A-coefficient[25] can be used to assess the settlement size distributions occurring in the Khabur Triangle (439) sites and in central

[25] I have used code written in R by E. Crema for calculating the A-coefficient.

Anatolia (440 sites) in the Middle Bronze Age (see Figs. 100 and 103 for a list of archaeological surveys in the Khabur Triangle and in central Anatolia). In this section, I will first show the results produced by performing rank-size analyses on the two whole study areas[26] (see Figs. 101 and 104) and assess comparatively any difference in the observed patterns between them. Second, I will break down each study area into smaller window analyses in order to detect how settlement size distributions change at a more local scale.

5.3.2.1 The Khabur Triangle versus central Anatolia

Figures 111 and 112 provide a picture for each study area of the most central group of settlement sizes (in hectares). We can see that the midspreads of the Khabur Triangle (the fifty percent of values between the 3rd and the 1st quartiles values; that is between 1 and 3.1 ha) and central Anatolia (between 1 and 2.8) match almost perfectly, and the values of median (1.7 vs. 1.5) differ just minimally. In general, these results show that there is little difference between the Khabur Triangle and central Anatolia in terms of the variability of observed settlement sizes. On the other hand, a Kolmogorov-Smirnov test shows a significant difference ($p = 0.003$) in site size and hierarchy between the two areas. This result becomes obvious if we consider that the largest settlements in the Khabur Triangle have a much bigger extent (in hectares) than the largest settlements in central Anatolia (see Fig. 113 summarising the settlements size in both areas). Figure 114 shows a rank size analysis for each study area. At first glance, both size distributions appear similarly convex. For the Khabur Triangle, the calculation of A-coefficient (0.26) and the 95% confidence error range (0.15 – 0.50) from the bootstrap technique tell us that we are 95% confident that the rank-size curve is convex (Fig. 115). For central Anatolia, the A-coefficient (0.31) and the 95 % confidence error range (0.24-0.53) show that the rank-size curve is significantly convex (Fig. 116).

Therefore, both results in the Khabur Triangle and in central Anatolia show a convex distribution for settlement size and rank. These results indicate that there is little

[26] The two present study areas have been designed and adapted to the boundaries of the archaeological surveys carried out in the Khabur Triangle and in central Anatolia.

political and economic integration among different independent and competing settlement systems occurring in the Khabur Triangle and in central Anatolia. This could well reflect the fragmented political situation occurring in both areas in the Middle Bronze Age, where city-states fought with each other and shifted alliances for exerting their power over the surrounding areas (for central Anatolia see Veenhof and Eidem 2008, 147-179; Barjamovic 2011a, 6; Barjamovic *et al.* 2012, 48-50; Palmisano 2014; for the Khabur Triangle see Charpin and Ziegler 2003; Veenhof and Eidem 2008, 290-321; Ristvet 2008 and 2012; Palmisano *in press*).

5.3.2.2 The Khabur Triangle

Having performed the above analysis on the entirety of the two study regions, it is worth breaking down each region into smaller areas in order to assess how the settlement size distributions change on a local scale. First, we can divide the Khabur Triangle into an eastern (to the east of the Wadi Jaghjagh) and a western part (to the west of the Wadi Jaghjagh) and then perform rank-size analysis for each of these two areas separately (see Fig. 117). The choice to split this region into two sub-areas is based on a debate over the past two decades about perceived differing sites densities in the eastern and western Khabur Triangle during the Middle Bronze Age (see Lyonnet 1996 and 2000; Wilkinson 2002; Fleming 2004; Ristvet 2005, 123-124; Ristvet 2012). This difference has been explained as due to presence of a more nucleated settlement pattern and small, more pastoral kingdom that made up the Ida-Maraş confederacy in the western Khabur Triangle (Charpin and Ziegler 2003, 53; Durand 2004, Fleming 2004), and a more dispersed settlement pattern characterised by more numerous and larger settlements in the eastern Khabur Triangle (Charpin 1987; Ristvet 2008). Two further sub-areas matching with the boundaries of the archaeological surveys carried around Tell Brak (Wright *et al.* 2007) and Tell Leilan (Ristvet 2005) have been subject to rank-size analysis (Fig. 117).

Figure 118 summarises the fact that there are indeed far more settlements and greater diversity of settlement sizes in the eastern Khabur Triangle, where the largest sites have a bigger extent of the largest sites located in the western Khabur Triangle. In the box-plot and table (Fig. 119) we can see that the midspreads of the western Khabur

Triangle (between 0.8 and 3 ha) and of the eastern Khabur Triangle (between 1 and 4) do not differ strongly, and the values of median (1.5 vs. 1.8) differ just minimally. A Kolmogorov-Smirnov test does not show a significant difference (p-value = 0.098) in site size and hierarchy distribution between the eastern and western parts of the Khabur Triangle. In a natural log scale the rank-size curves of eastern and western Khabur Triangle are convex and appear very similar except for the scale of magnitude (Fig. 120). This can be nicely explained by the fact that, overall, settlements in the eastern Khabur Triangle are larger than those in the western Khabur Triangle. Then, the *A*-coefficient has been calculated on both areas. For the West Khabur Triangle the calculation of *A*-coefficient (0.28) and the 95% confidence error range (0.17 – 0.55) from the bootstrap technique tell us that we are 95% confident that the rank-size curve is convex (Fig. 121). In the east Khabur Triangle, the *A*-coefficient (0.22) and the 95 % confidence error range (0.10-0.49) show that the rank-size curve is significantly convex (Fig. 122).

Furthermore, a log-scale plot of the rank-size curve of the area around Tell Brak shows a primo-convex distribution with the overall *A*-coefficient (0.27) resulting as the difference between the positive A_1 values of the convex curve (0.30) and the negative A_2 values of the primate curve (0.03; Fig. 123). The 95% confidence error range for A_1 (0.12-0.62) and A_2 (-0.01 – -0.08) show that rank-size curve is significantly primo-convex (Fig. 123). A rank-size plot of the area around Tell Leilan shows a double-convex distribution of settlement sizes and the calculation of an overall *A*-coefficient (0.11) and the 95% confidence error range (-0.07 – 0.41) show that the curve is significantly double-convex (Fig. 124).

Overall, both the western and eastern Khabur Triangle show a very similar dispersed pattern that could be the result of pooling in the same analysis different competing city-states and petty kingdoms occurring in both areas (see Fig. 125). The difference between the two parts of the Khabur Triangle is in the magnitude of the settlement sizes, where the settlements distributed in the eastern Khabur Triangle are far larger than the settlements in the western Khabur Triangle. Nevertheless, if we perform rank-size analysis on a smaller local scale, we can detect some differences between the settlement patterns occurring in the two areas. In fact, the area around Tell Brak to the west of the Wadi Jaghjagh is characterized by a primo-convex distribution, where the largest site (Tell Brak) imposes a centralized system on a lower-level settlement system of satellite communities and medium-small villages (Fig. 125). On the other hand, a double-convex curve in the Tell Leilan area represents the presence of two contemporaneous settlement systems operating within the same region at different scales (Fig. 125). More precisely, the upper convex curve represents the largest sites of the east Khabur Triangle (Tell Leilan, Tell Farfara, Tell Mohammed Diyab) superimposed on a more loosely integrated system (the lower of the two convex curves).

5.3.2.3 Central Anatolia

We can now perform the same break-down of the Central Anatolian region into smaller areas in order to assess how the settlement size distributions change at smaller local scales. The study area can usefully be divided into four smaller windows of analysis matching with the boundaries of archaeological surveys carried out in the area around Kayseri (see Kulakoğlu *et al.* 2009-2011), Varavan Höyük and Altilar Höyük (Omura 1997 and 2003-2007), Yassihöyük (Omura 2001-02 and 2008), and with an arbitrarily defined area around Boğazköy (see Fig. 126).

A log-scale plot of the rank-size curve of the area around Kayseri shows a primate curve with the *A*-coefficient (- 0.40) and the 95% confidence error range (-0.09 – 0.79) suggesting that the rank-size curve is primate (Fig. 127). This primate distribution might be stronger if we remove the 2th ranked site Sevket Tepesi (25 ha), which is the easternmost site of the window of analysis and could be part of a different settlement system (see Fig. 126). In the area surrounding Boğazköy, the rank-size curve is primate and both the *A*-coefficient (-0.47) and the 95 % confidence error range (-0.81 – 0.17) show that the settlement size distribution is likely primate (Fig. 128). Because the maximum value of *A* with 95 % confidence error is 0.17, which represents a convex distribution, in this case we are less than 95 % confident that the distribution is primate. Furthermore, a log-scale rank-size curve of the area around Yassihöyük is convex and both the *A*-coefficient (0.21) and the 95% confidence error range (0.04 –

0.50) show a significant convex settlement size distribution (Fig. 129). A rank-size plot of the area to the north of Tuz Gölü lake shows a double-convex distribution of settlement sizes and the calculation of an overall *A*-coefficient (0.29) and the 95% confidence error range (0.10 – 0.63) show that the curve is significantly double-convex (Fig. 130).

It seems that different settlement patterns co-existed in central Anatolia in the Middle Bronze Age (see results in Fig. 131). In the area around Kültepe and Boğazköy, the rank-size analyses suggest that those two large centres may have imposed a strong centralized political and economic system over smaller neighbouring communities and villages. In the case of Boğazköy, the width of the confidence interval provide only a frustratingly fuzzy picture of the real dynamic as we are less than 90% confident that the settlement size distribution is primate. In the area to the north of the Tuz Gölü lake we have what might be called a double-convex distribution, which may represent the superimposition of the settlement system constituted by the two largest sites of the area (Varavan Höyük and Altilar Höyük) over a lower ranked settlement system of smaller communities and villages. In the end, the area around Yassihöyük, between the Delice River to the north and the Kızılırmak River to the south, shows a more dispersed pattern and a less vertical integration between communities living in the area (Fig. 131).

5.3.3 Discussion

So far, in this chapter, I have first provided a more global picture about regional settlement patterns occurring in central Anatolia and in the Khabur Triangle, and then focused on how settlement size structures change at a more local scale. Both central Anatolia and the Khabur Triangle show very similar dispersed settlement patterns when considered as a whole (see Figs. 115 and 116) but these results can be explained as the consequence of pooling different settlement systems, that could be better explained on a lower local scale, into the same window of analysis. In other words, at this larger regional scale, both central Anatolia and the Khabur Triangle in the Middle Bronze Age are characterized by fragmented politically landscapes of competing independent polities that are loosely integrated (for central Anatolia see Veenhof and

Eidem 2008, 147-179; Barjamovic 2011a, 6; Barjamovic *et al.* 2012, 48-50; Palmisano 2014a; for the Khabur Triangle see Eidem 2008, 290-321; Ristvet 2008 and 2012; Charpin and Ziegler 2003; Palmisano *in press*). When we break down each region in order to investigate how settlement size structures change at different local scales, both the eastern and western parts of the Khabur Triangle show similar dispersed settlement patterns (see the results in Fig. 125) that probably reflect the presence of different independent competing city-states in both areas and a central-place settlement structure, where bigger urban centres were surrounded by secondary towns, villages, small farmsteads, and seasonal camp-sites. At this scale, the difference between the two areas is characterised by the differing size of the largest settlements, with those in the eastern Khabur Triangle (Tell Leilan = ca. 90 ha) having a bigger extent than those in the western Khabur Triangle (Tell Mozan =ca. 35 ha). The available survey data allow us to investigate more deeply the settlement patterns in Tell Brak and Tell Leilan's areas (respectively the areas surveyed by Wright *et al.* 2007 and Ristvet 2005), and for Tell Brak's area the settlement system is more nucleated in one big centre (Tell Brak), with a contemporaneous settlement system of nearby satellite medium-small size villages. On the other hand, in the Tell Leilan area, the general settlement pattern appears more dispersed among large settlements of equivalent economic or administrative function (Tell Leilan, Tell Farfara, Tell Mohammed Diyab, Tell Aid, Hansa, and Dumdum) superimposed on a more loosely integrated settlement system of medium-small settlements. Furthermore, the different settlement patterns occurring in the western and eastern Khabur Triangle could be respectively explained with the presence of a rough coalition of kinglets (Ida-Maraş confederacy), along and to the West of the Wadi Jaghjagh, predominantly based on pastoral/semi-pastoral economy, and the territory near Šubat-Enlil/Šehna (Tell Leilan), which was mostly agricultural (dry farming; see Joahnnes 1996, 344-345; Lyonnet 1996 and 1997; Wilkinson 2000 and 2002; Ristvet and Weiss 2005 and 2013).

Central Anatolia can be broken down into four smaller sub-regions, and the results show that around Kültepe and Boğazköy, we have strong vertical centralization with one large centre dominating over smaller sites. On the other hand, the area around Yassihöyük shows a more dispersed pattern characterized by a less obvious vertical political integration among competing communities. The area to the north of Tuz Gölü Lake shows the superimposition of the two largest centres, Varavan Höyük and Altilar Höyük, over the surrounding rural communities of medium-small satellite villages (Fig. 130). The double convexity of the resulting rank-size curve could be due of pooling in the same analyses those two large sites that may have belonged to two different settlement systems. If so, the rank-size analyses for both the areas around Altilar Höyük and Varavan Höyük would result in primo-convex settlement size distributions.

The rank-size analysis's results show some differences between central Anatolia and the Khabur Triangle at smaller local scales (see Fig. 132). In fact, in central Anatolia settlement systems appear more nucleated in large centres dominating their surrounding rural hinterlands and strong political and economic centralization is evident at Kültepe and Boğazköy (Fig. 132a). On the other hand, in the Khabur Triangle the patterns appear less clustered and we have the superimposition of large urban centres on well (Tell Brak's area) or more loosely integrated (Tell Leilan's area) settlement systems of smaller sites (medium-small villages, farmsteads and camp-sites; Fig. 132b). In Anatolia, a more remarkable vertical integration is the result of an even spatial distribution of large settlements that could then dispose of large rural hinterland over imposing a more centralized political and economic control. On the contrary, in the Khabur Triangle the largest sites were packed in a smaller plain area, where the lack of marked topographical features (e.g. wide rivers, mountain ranges) could have further enhanced competition between large city-states of comparable size and political prominence and determined unstable and "fluid" territories (cf. Eidem 2000, 257).

5.4 Spatial Interaction Models

The rest of this chapter moves on to consider a kind of geographic computer simulation known as a spatial interaction model which can be helpful for understanding past human settlement hierarchy in the Khabur Triangle and in Central Anatolia during the Old Assyrian colony period (ca. 1970-1700 BC). The distribution of settlement sizes in these regions was relatively broad, with numerous small and medium sized sites and only a few large sites. This settlement structure arguably reflects the actual political landscape in the early second millennium, which was divided into several independent city-states governed by a king or a ruling couple (for central Anatolia see Veenhof and Eidem 2008, 147-179; Barjamovic 2011a, 6; Barjamovic *et al.* 2012, 48-50; for the Khabur Triangle see Charpin and Ziegler 2003; Veenhof and Eidem 2008, 290-321; Ristvet 2008;). It is not well understood how such settlement size structures developed on the basis of inter and intra-regional interactions and socio-environmental factors. Therefore, a methodology is needed for understanding the causal logics behind past human settlement size dynamics. To achieve this, I propose applying a relatively novel method to predict which sites and areas would have become prominent in this period by using known archaeological sites as point data and historical information for calibration purposes. The modelling results can be checked against empirical results of archaeological surveys undertaken in the Khabur Triangle and in central Anatolia in the past decades. The models below address to what extent geography, transportation, external contacts, and socio-economic/environmental factors make locations attractive for trade and settlement and why some archaeological sites become relatively major urban centers in the period discussed. This includes how political and geographic constraints affect regional settlement transformations, while also accounting for uncertainty in the archaeological data.

This methodology builds on a series of models that were originally introduced in the 1960s and 1970s in geography to predict flows of goods and people in spatial systems (Wilson 1967, 1970, 2008, 2010; see Wilson 2012a for a recent overview), and then applied to archaeological settlement datasets in a series of academic papers published some twenty-five years ago (Rihll and Wilson 1987) and again in the last couple of years (Wilson 2012b; Altaweel 2013 and 2014; Bevan and Wilson 2013; Davies *et al.* 2014). These simulations have the advantage of explaining how general causal factors (e.g. ideology, population pressures, political and territorial divisions, topographical boundaries, etc.), that are difficult to isolate and quantify from the archaeological record, could have affected settlement expansion or contraction in a given geographic setting. Hence, the target of this section is to present a simple simulation model that not only explores how major settlements emerge, but how such emergence develops at the expense of other sites and because of political circumstances or external factors affecting a region. At a more general level, the results demonstrate that a quantitative model is useful in explaining emergent urban settlement hierarchies across landscapes at different scales.

In this section, I will introduce and explain the methodology of entropy maximizing and structural dynamics modelling approaches. After this, the modelling results, including outputs from different possible scenarios, are provided. These results explore different factors that may catalyse or diminish urban population growth. Finally, conclusions are drawn with regard to the methodology and its potential for understanding the development of settlement hierarchies in the Khabur Triangle and in central Anatolia during the Old Assyrian colony period.

5.4.1 Methodology

Entropy maximising methods have been widely used to predict urban economic or population growth in spatial systems under conditions of uncertainty (Wilson 1967 and 1970). These models have been used to describe not only urban growth in a given geographical context, but also on smaller scale settings such as the growth of modern retail outlets and particular areas within modern cities (Birkin and Heppenstall 2011; see Wilson 2012 for a broad overview). These methods combine Boltzmann's equations from statistical physics and the ecological models of Lotka and Volterra (Wilson 2008). In this case, several factors such as distance, topography, economic and political relevance, ideology, and movement are incorporated as generalized variables to explain urban transformations. These variables allow one to detect general social and environmental conditions responsible for the growth of specific areas and/or urban centres and the decline of others. Specifically, the aim is to produce simulations which predict the urban layout of a given spatial system, in order to explain under what dynamics certain sites may have acquired relative prominence. The validity of the model will be assessed by comparing the correspondence between the simulated outputs and the empirical archaeological and textual data.

Entropy maximizing models allow feedback and interaction systems between settlements and explain how the urban growth of some urban centres/areas may affect surrounding regions. In fact, positive feedback allows major urban centres and regions to grow to a greater extent, while negative feedback diminishes the economic and social positions of other regions (see Krugman *et al.* 1995). In pre-industrial societies "pull" factors such as geography, environment, transport, economy, ideology, and social institutions may have contributed to positive feedback enabling major urban centres to expand further and simultaneously diminishing the population and economic potential of the surrounding regions or centres (see Braudel 1995; Batty 2005; Wilson 2012a). However, some factors could have played a more relevant role in the growth, stabilisation or decline of a given settlement. Put simply, the analysis I present uses a well-established formulation for spatial interaction modelling, which suggest the general trends and factors that may have affected the urban development and the settlement hierarchies in central Anatolia in the early second millennium BC. The spatial data required for the model are respectively 439 and 440 sites for the Khabur Triangle and central Anatolia. I have estimates of the extent of each site, based on the published archaeological surveys report, which provide a relative proxy for each settlement's population (see Figs. 100 and 103). The topographical data are represented by an Aster Global Digital Elevation Model (GDEM) of the whole study area download from the NASA's official website (http://reverb.echo.nasa.gov).

5.4.2 Model Structure

For the purposes of this chapter, a spatial interaction model of the type already used in other contexts (see Wilson 1967 and 1970; Harris and Wilson 1978; Altaweel 2013 and 2014; Bevan and Wilson 2013; Davies *et al.* 2014), has been applied to understand which general factors may have affected the growth or the contraction of settlements in the Khabur Triangle and in central Anatolia during the Old Assyrian Colony Period (ca. 1970-1700 BC). Here, we define the following variables for each of the sites (see the Appendix for further details about the method):

- X_i = volume of flow or population (e.g. people and/or goods) originating at a given site *i* in relation to another settlement *j*;

- Z_j = the size of site and initial advantages/attractiveness *j*, which might regulate flow.
- α = return of attractiveness for site *j* that leads to migration or movement of people;
- β = willingness or travel capability of individuals to travel a given distance to a settlement;
- *d* = the distance (i.e., cost of travel) between any two sites *i* and *j*, normalised by the mean of all such distances and using cost surface.

In summary, the variables above determine how much in-flow of people and/or goods to a specific site *j* on the basis of its attractiveness (α), willingness or ability to travel (β), and distance (*d*) in relation to the population (X_i) of a given settlement (see Fig. 133). More precisely, the distance (d_{ij}) between each pair of sites is modelled through a matrix of travel movement costs generated by considering the topography and the geographical features (e.g. hills, mountains, rivers, etc.) of a given study area that may have constrained the movement (see Fontenari *et al.* 2005 for the algorithm used; Palmisano 2013b, 774-781, for a discussion about modelling past human movement). Another way to define *d* might also take into account social factors (e.g. political or territorial divisions) that may have affected the movement between settlements. The attractiveness of a site (α) is a general variable used to determine which political, economic, religious, social or environmental factors may have made specific settlements more attractive than others (i.e. for migration or commerce). This variable α is set globally for all sites and specifies the scaling of utility as sites size (Z_j) varies. Another important factor is the initial size of site *j* (Z_j) defining, for instance, each site's initial advantages (e.g. military power, political dominance, religious prestige) or interaction with sites outside the study area, which would be manifested as an additional flow of goods and people for each site. For my purposes, this variable (Z_j) is also useful for modelling any sort of external trade contacts between the sites in my two study areas and other regions. Finally, the variable (β) defining the willingness, the freedom, and the capability of movement is worthy of a brief methodological discussion. As β increases, an individual's preference to travel shorter distances increases for any reason, while as β decreases, individuals travel longer distances. So, this variable may be used for determining general factors that may have favoured (e.g. roads, privileged pathways between settlements) or constrained (e.g. rivers, territorial or political boundaries, warfare) the movement between settlements. Therefore, using entropy maximising methods, the most likely set of flow, given that the total flow originating at each site is known, is then found under specific parameters of generalized variables.

The model is characterized by two steps: 1) the estimation of interaction flows among sites; 2) the determination of site size by summing the interaction flows. The first step consists of establishing the utility of interaction between any pair of sites *i* and *j.* This results as a cost/benefit calculation, where the benefit is a function of the size of *j* and the cost is the physical impedance (e.g. distance) between sites *i* and *j*. At this stage the variable α indicates the scaling of utility as the size varies and β defines the strength of the negative effect of travel cost. Therefore, in a given spatial system where the total flow originating at each site is known, entropy-maximizing methods are able to detect the most likely distribution of that total flow among other sites. Put simply, for any given site *i*, the total out-flow X_i is shared between each other site *j* in proportion to the utility of interaction with *j* as perceived by *i.* In this way, the model finds the flow S_{ij} between any such pair of sites.

In the second step the interaction flows are used to update the sites' size, which consists of determining the growth/decline of each site under the calculated set of flows. Thus, for each site *j* the total inward flow (D_j) *is* found by summing S_{ij} over all *i*, and then this value is compared with the site's current size Z_j. If the total flow is less than Z_j, the current size is unsustainable and the site shrinks, whereas a surplus of inward flow leads to the growth of j. Having made these calculations and adjusted X_i and Z_j accordingly, the model proceeds to the next-time step and the process is repeated. For any individual simulation, I run the model for a set number of discrete steps δt.

The flow S_{ij} between each pair of nodes *i* and *j* is calculated using the following formula:

$$S_{ij} = X_i \frac{Z_j^{\alpha} e^{-\beta d_{ij}}}{\sum_k Z_k^{\alpha} e^{-\beta d_{ik}}} \tag{1}$$

These flows are summed to give the total incoming flow D_j to each site j:

$$D_j = \sum_i S_{ij} \tag{2}$$

This incoming flow is used to calculate Z_j at the next time step, with ε used to control the speed of change and k a constant that can be used to scale Z_j, $Z_j^{(t+\delta t)}$, using:

$$Z_j^{t+\delta t} = Z_j^{t} + \varepsilon(D_j - kZ_j^{t}) \tag{3}$$

Next, $X_i^{(t+\delta t)}$ for the following time step is determined by taking the corresponding $Z_i^{(t+\delta t)}$ value, normalized for the total of $Z_i^{(t+\delta t)}$ for all sites, and rescaling (n) so that sum of all $X_i^{(t+\delta t)}$ continue to have the same mean as the simulation start and population is adjusted for the next simulation time for each site (i):

$$X_i^{t+\delta t} = n \frac{Z_i^{t+\delta t}}{\sum_k Z_k^{t+\delta t}} \tag{4}$$

Then the model goes back to (1) for the next time step and continues until the end of the simulation.

5.4.3 Results

Based on the above model, in this section I will make use of simulations in order to explore any possible variation in model outputs based on parameter choices, manipulation of the underlying dataset, and synthesis of results. More precisely, the model involves three general parameters (α, β and Z_j) that can be modified to give different sets of initial conditions. Results are then able to provide insights about how human settlement hierarchies may have developed in the Khabur Triangle and in central Anatolia in the early second millennium BC. Each simulation will provide as observable output the final site size Z_j for each site j, upon which to base the following assessments: 1) comparison between the numerical estimates of simulated values and the observed sites size by using statistical tests; 2) the extent to which the largest sites in the real data are found to be large in the simulated runs; 3) mapping of outputs and evaluation of their historical validity. Given these assumptions, the results of two different scenarios will be assessed here. The first scenario will provide a baseline case where the values of all variables will be equal for all sites, so that it will be possible to test the role of geography and transport in shaping urban growth and settlement size structures. In the second scenario, we will account for any effects and factors not explicitly included in the model that will produce a distribution of site sizes and ranks similar to the real data (e.g. foreign contacts and trade from outside my study areas may have affected urban growth). This will allow me to test which values of general variables (α, β, and Z_j) are required for specific sites in order to recreate urban layouts similar to those known from the archaeological and textual evidence.

5.4.3.1 Scenario 1: The Benefit of Geographic Location

In this scenario, the aim is to identify which sites could have taken advantages of their geographic location and to which extent site attractiveness (α) and willingness to travel or capability of movement (β) could have affected urban growth and settlement structure in the assessed areas. In this context, as α increases, feedback to site attractiveness is increased, while the increase of β indicates more constraints to movement and then less capability to travel for long distances. More precisely, in terms of human behaviour, we can say that at a given β value, the attractiveness of a site A to a site B several kilometres away, is half of what it would be if site B was immediately next to site A. In this scenario initial condition values such as size (Z_j), population (X_i), attractiveness (α), and capability of movement (β) are equal for all sites at the beginning of the simulation,[27] and an incremental changes of parameters is done to the α and β values. This is done to see how variations of site attractiveness and movement impedance affect populations and if certain sites consistently appear as relatively larger or smaller settlements. The simulation ends when the population and size results are considered stable, resulting in runs being about twenty simulation ticks long. In this scenario, α is incrementally increased to 10 and β to 0.1 (step intervals of 0.001), with β values greater than 0.1 causing simulation to fail. These simulations are not intended to produce realistic site hierarchies, but instead to detect which sites could have benefited from their geographical location by reproducing, at least, the known settlement size distribution. This requires a measure of the linear correlation between the simulated and the observed settlements size distributions,

[27] Specifically, size (Z_j) and population (X_i) are set to 1 for all sites.

and for this I will use the Pearson product-moment correlation coefficient (also known as Pearson r^2; see Galton 1877; Pearson 1895). I calculated the correlation of simulated site sizes to observed site size estimates, having first sorted each set by size. Then, two grids of search of parameters were produced in order to explore the goodness of fit for various configurations for central Anatolia and the Khabur Triangle (see Fig. 134a-b). Each grid shows values ranging between 0 in case of the worst fit, to 1 for the perfect fit for a sampling of the parameters of α and β. The resulting plots are similar for both central Anatolia and the Khabur Triangle and differ just slightly. For both study areas the best fits are found for quite high values of α and low values of β.

The parameters' values exhibiting the strongest Pearson r^2 correlations are given in Fig. 135, while the modelled settlement sizes are mapped in the Figs. 136 and 137. The strong correlation values for both study areas show that the model has successfully reproduced the settlement size distributions. Although these results show good agreement in terms of site size distribution, the sites known for large estimated size in the observed data tend not to be those which the model predicts to be large. The failure to identify precise sites does not necessarily imply that the model has not identified more general geographical areas, which would be expected to feature large sites. Of course, in reality, there are various factors that lead to the dominance of certain sites (e.g., earlier settlements could initially be larger, socio-environment factors may favour one site vs. others), whereas only geographic location is included here. Of course, if the analysis is widened, though, to consider situations where the dominant simulated site is not one of the true largest sites, but is in close proximity to one, it is possible to find the extent to which the localities of large sites are identified. In this baseline scenario the low values for β (=0.001 and 0.002) provide an output where any individual is free to travel between settlements through the landscape (Figs. 136 and 137). In central Anatolia, the area to the north of Lake Tuz Gölü and Kızılirmak River between the Bozok and the Haymana Plateaus result as the more likely to attract a greater portion of population (e.g. people and goods; Fig. 136). Therefore, these parameter sweeps provide an output where known big centres such Altilar Höyük, Yassihöyük and Varavan Höyük acquire high population values, while other known large sites such as Açemhöyük, Alişar Höyük, Bogazköy, and Kültepe do not become prominent. If we have a look at the results in the Khabur Triangle, the area along the Wadi Jaghjagh seems to be advantageous for settlement urban growth. In this case, it seems that just Tell Brak could have benefited from its geographical location (Fig. 137). The present scenario shows how, in central Anatolia and in the Khabur Triangle, the geographical location may have benefited the growth of some known large Middle Bronze Age urban settlements (Altilar Höyük, Yassihöyük, Varavan Höyük, and Tell Brak). However, it is not sufficient to explain the development of other important urban sites (e.g. Açemhöyük, AlişarHöyük, Bogazköy, Kültepe, Tell Leilan, Tell Mozan, Tell Mohammed Diyab), even though these might have also been influenced to some lesser by their local position within central Anatolia and in the Khabur Triangle.

5.4.3.2 Scenario 2: Reproducing Settlement Hierarchies

The results of the previous scenario show that known large Middle Bronze Age sites, in general, do not emerge in a model based solely on geographical location. Therefore, to distinguish such sites and reproduce settlement hierarchies more comparable with the known urban layout (from the archaeological and textual evidence) occurring in central Anatolia and the Khabur Triangle during the Old Assyrian colony period (ca. 1970-1700 BC), some modifications to our initial model are required. Unlike the previous scenario, where initial conditions for sites' size (Z_j) are set to 1 for all sites, in what follows I will instead differentiate the initial size (Z_j) for each site accordingly to the known estimated sizes about the sites in question. In this way the model set-up already begins by favouring certain sites at the expenses of others. In more concrete terms, this could be regarded as accounting for any effects not explicitly included in the model (e.g. historical political or religious prominence, pre-existing trade contacts, etc.), which currently only considers the spatial configuration of the system. In fact, the variable size (Z_J) is used as a relative proxy to regulate the flow of goods and people into a specific site. So, the higher is the initial size value (Z_j) the more attractive is a site to settle (Davies *et al.* 2014, 145). My approach is, therefore, to use the Middle Bronze Age site estimated sizes as an alternative to separate parameterisation of different factors (e.g. political prominence, inter-regional trade, favourable environmental conditions) that have a material effect on the real-world outcome but are not included in the baseline scenario 1 (which just incorporates geographical location).

In this second scenario, the simulations are intended to reproduce both the known settlement hierarchy and the site size distribution. To do this, I will measure the linear correlation between the simulated and observed site size distributions (Pearson's r^2), and the rank-order correlation between the modelled and real settlements rankings (Spearman's rank correlation). Therefore, perfect rank order relationship is assigned a value of 1, while for no correlation is assigned a value of 0. It is important to point out that "a rank order relationship has nothing to do with the actual magnitude of the rankings for settlements size, but rather only with the order of the rankings" (Drennan 2000, 210). For this reason, Pearson's r^2 and Spearman's rank correlation cannot be compared directly. In fact, as we can see in the heat maps produced to investigate the goodness of fit for various configurations for central Anatolia (Fig. 138) and the Khabur Triangle (Fig. 139), not necessarily high Pearson's r^2 values correspond to high Spearman's correlation values and vice versa. In order to avoid this problem, I produced two new heat maps by averaging the Pearson and Spearman's correlations for each parameters configuration (Fig. 140a-b).

The parameters' values giving the strongest correlations in terms of settlements' rank and size are given in Fig. 141, while the modelled settlement sizes are mapped in the Figs. 142 and 143. The resulting good fit shown by the heat maps indicates that the model has successfully reproduced the observed data. A natural log scale showing settlement size and hierarchies for normalised simulation and observed data, ranking from largest to smallest, is displayed in Figs. 144 and 145 for central Anatolia and the Khabur Triangle. It is interesting to notice how, in both study areas, the rank-size distributions of modelled and empirical data are similar in the upper ranks, but differ for the lower ranks. These results show the ability of the model to identify large settlements and reproduce settlement hierarchies by a small amount of additional information to the first baseline scenario. It is interesting to notice that the best model fit for both central Anatolia and the Khabur Triangle is with similar high alpha values (respectively 7 and 7.3) , while β values are higher for the Khabur Triangle (3.3 vs. 2.5; Fig. 141).

Visual inspection of the results in Figs. 142 and 143 shows, at a first glance, that both central Anatolia and the Khabur Triangle are characterized by significant clustering of sites. This could be the result of the uneven intensity of the archaeological surveys carried out in the areas or related to the contemporaneousness of the modelled sites that lie within a wide lifetime range. In fact, it is plausible that only a subset of the modelled locations were in existence during the Old Assyrian Colony period. In addition, since every site represents a source of flow (e.g. people and goods), a dominant site situated in an area with high site density has a larger potential in-flow and probability of reaching a large size than a similarly dominant site located in a sparse region. To deal with this problem and the uncertainty in my original dataset, I will make use of bootstrap statistics technique. This consists of performing 500 simulations, where, for each simulation, I have randomly removed a subset of *n* of the sites according to four different probability settings (0.05, 0.15, 0.25, and 0.5). When all simulations are complete, the mean modelled size of each site across all the simulations is interpreted to be the modelled sites' population. This method is based on the assumption that each sampling represents a possible 'state of the world', and that averaging in this way accounts for uncertainty about the composition of the original dataset. So, I carried out *S* simulations for each of the Khabur Triangle and central Anatolia's datasets and with *n* of sites and parameters as specified in the Fig. 146. The results show good consistency between the simulation results performed with the original whole dataset and the different subsets of samples for both central Anatolia and the Khabur Triangle. The results are statistically significant in all cases. Put simply, sites which are found to be large under the original scenario 2 algorithm remain large under this random sampling.

5.4.4. Discussion

The results above demonstrate the utility of a spatial interaction model for exploring how geographical settings and unspecified social, political, and environmental factors may have affected the urban growth and the settlement hierarchies in central Anatolia and in the Khabur Triangle during the Old Assyrian Colony Period (ca. 1970-1700 BC). The advantage of this modelling approach is that it enables researchers to account for missing empirical data and to reproduce outputs matching the known historical and archaeological evidence for explaining which generalized phenomena (e.g.

geographical location, political or religious importance, trade contacts, etc.) may have caused settlements' growth, stability or decline. On the other hand, the weak point of the present method is that we do not know which specific factors caused the observed results. Hence, the outputs may be used for highlighting general settlement hierarchy patterns and for providing general explanations about the development of past human settlement hierarchies.

The simulation's results show how local geography alone may have played an important role in determining why some settlements in central Anatolia and the Khabur Triangle such as Atlilar Höyük, Varavan Höyük, Yassihöyük and Tell Brak became larger than others. Surprisingly, Kültepe does not appear large in the simulation results. This is due to the fact that its prominence could be better explained on a larger interregional spatial scale rather than with the local Anatolian geography. Nevertheless, the geographic location cannot explain the past human settlement hierarchies as local interaction alone seems to not make known major Middle Bronze Age centres large. In particular, the Khabur Triangle for its geographic location and for the lack of natural borders does not provide some relative isolation, possibly maximizing exogenous influences from more distant settlements and regions. This area has mostly been a buffer-zone between political entities based outside the area, and so the changes occurred in this region in the early second millennium BC should be regarded in the perspective of international developments involving the neighbouring areas.

Because the location data alone were not sufficient to explain the dominance of most known large sites, in the second scenario it was necessary to include a certain amount of known information about the sites in question. This process required the manipulation of initial conditions of some model's parameters. Particularly, it was found that closer matches tended to be associated with differentiated values of initial size Z_j for each site, a parameter controlling a wide range of different factors (e.g. political or religious prominence, trade contacts, etc.) which can be related specifically to the nature of the data. The results generally show that other non-geographic factors do make specific known sites larger, as sites become relatively large through modifications to initial size Z_j and incremental changes of parameters to the α and β values. The fact that for central Anatolia and the Khabur Triangle the best fits are found in very similar parameters' configurations, particularly in terms of α and β, implies that there is no marked difference in the settlement size structures between the two areas (Figs. 140 and 141). Both areas show high α and relatively high β values that, translated to the discussed historical data, reveal politically fragmented landscapes characterized by the presence of several competing peer polities aiming to exert their influence over their surrounding hinterland. As consequence, a larger percentage of the population is concentrated in fewer larger centres as the willingness of travel or the capabilities of movement are restricted (high β values), thereby leading to the establishment of larger local sites that also exert their power over their surrounding hinterlands and, therefore, absorb more flow from nearby sites (i.e., which reflects higher α). In the Khabur Triangle, higher β values indicate less movement capability and willingness of travel across the landscape in comparison with central Anatolia. This could reflect the political situation occurring in the Khabur Triangle, where the largest sites were packed in a smaller plain area in which the lack of marked topographical features (e.g. wide rivers, mountain ranges) could have further enhanced competition (e.g. warfare which reflects higher β) between large city-states of comparable size and political prominence (Eidem 2000, 257; Charpin and Ziegler 2003; Veenhof and Eidem 2008, 290-321; Ristvet 2008 and 2012; Palmisano *in press*). In particular, it seems that Tell Brak, Tell Leilan and Tell Mozan in the MBA would need greater exogenous effects or initial advantages to enable them to consistently reach a relatively greater size. This could come in the form of Šamši-Adad I making Tell Leilan (the ancient Šubat-Enlil) an important political capital (Charpin 1987; Eidem 2008; Ristvet 2008), Tell Brak being the seat of the "Lady of Nagar" (Oates et al. 1997, 141), and local or external benefits that Tell Mozan, Tell Muhammad Diyab and Tell Farfara may have relative to other sites.

In central Anatolia, the constraints placed on movement due to factors such as political and territorial divisions could have made individuals travel shorter distances and may have also concentrated the flow of people from surrounding rural communities into few large local large urban centres (see Bachuber 2012, 576-578).[28] This may reflect well the central Anatolian political landscape fragmented into numerous independent city-states during the Old Assyrian Colony Period (ca. 1970-1700 BC; cf. Barjamovic 2011a, 6; Barjamovic *et al.* 2012, 44-49). In central Anatolia, the geographical location does not explain alone why sites such as Açemhöyük, Alişar Höyük, Bogazköy and Kültepe became prominent in the early second millennium. The results show that the urban growth of those sites could be related to trade, external contacts and other general advantageous factors (e.g. political prominence, military power, religious prestige, etc.). The simulation's outputs are particularly interesting for Kültepe, which requires high values of initial Z_j to start becoming large. This reflect the international character of this site, which hosted an Old Assyrian *kārum* and was one of the main hubs of the commercial trade network set up by the Assyrians in Upper Mesopotamia and Central Anatolia (see Barjamovic 2008 and 2011, Veenhof 2008b). Put simply, the urban development of Kültepe cannot be explained in terms of local interaction within central Anatolia, but it may be the result of external contacts and long-distance trade activities with other regions and settlements. In fact, the archaeological evidence from Kültepe's lower town (level II and Ib) such as balance pan weights belonging to different regional weight systems, Khabur ware and Syrian bottles show the involvement of Kültepe in long-distance contacts with Syria and Northern Mesopotamia (see Aubet 2013; Ascalone and Peyronel 2006, 401-421; Emre 1999; Oguchi 1997; Özguç 2006; Özguç-Tunca 2001). Another important site whose urban development could be related to external contacts and trade is Açemhöyük. The role played by this centre during the Middle Bronze Age is reflected from the two palaces Sarıkaya and Hatipler (level 3-4) that have yielded archaeological evidence (e.g. seals, clay bullae, pottery, etc.) showing long-distance contacts with upper Mesopotamian Amorite dynasties (cf. Özguç 1980, 67; Özguç-Tunca 2001, 128). This site has long been identified with Purušhaddum (cf. Forlanini 2008, 65-66; Kawakami 2006; Veenhof and Eidem 2008) but recently Barjamovic has identified it with Ulama, the seat of a an Assyrian *wabartum* (Barjamovic 2011a, 411).

[28] The Middle Bronze Age rural hinterland of the central Anatolian plateau is archaeologically elusive and under-investigated. No intensive archaeological surveys of the agricultural settlements surrounding major archaeological sites have ever been carried out for the Middle Bronze Age. The early second millennium farming hinterland is well attested in some textual evidence (see Forlanini 1992, 176; Dercksen 2008, 139; Barjamovic 2011a, 232-235).

5.5 Summary

This chapter first offered an overview of the theoretical aspects (e.g. definition of study area and scale of analysis) and methodological problems (data recovery quality, sampling strategy, chronological resolution) that we need to take into account when interpreting past human settlement patterns for surveys. Two kinds of analyses were chosen for answering the first research question of the present doctoral thesis: to what extent can known archaeological sites and historical information be used to clarify past human settlement hierarchies in central Anatolia and in Upper Mesopotamia during the Old Assyrian period. The two chosen approaches were rank–size analysis, which is useful to distinguish nucleated versus dispersed settlement patterns; and spatial interaction modelling which, instead, detects how the spatial configuration of sites might explain urban developments and settlement hierarchies in a given study area. The adoption of these methods is not straightforward due to the problems arising from the spatial and temporal uncertainty of the archaeological data. The use of the bootstrap technique has been proposed as solution for dealing with the problem.

By combining our assessment of rank-size distributions and spatial interaction models we can achieve a more detailed overview of past settlement hierarchies in central Anatolia and in the Khabur Triangle and how they might have eventuated. A comparative perspective between the two study areas can be summarised via the following points:

- At a regional scale, both Central Anatolia and the Khabur Triangle show very similar convex settlement size distributions in the Middle Bronze Age. These results are perhaps partly a consequence of pooling different settlement systems and surveys into the same window of analysis. However, the results do nonetheless also suggest that central Anatolia and the Khabur Triangle in the Middle Bronze Age were characterized by fragmented political landscapes of competing independent polities loosely integrated.

- At smaller, more local scale, the central Anatolia settlement systems of the Middle Bronze Age appear more nucleated, with large centres dominating their surrounding rural hinterlands, and strong political and economic centralization (e.g. as evident at Kültepe and Boğazköy). On the other hand, in the Khabur Triangle the patterns appear less clumped and we have the superimposition of large urban centres on well (Tell Brak area) or more loosely integrated (Tell Leilan area) settlement systems of smaller sites (e.g. medium-small villages, farmsteads and camp-sites).

- In modelling terms, both areas are most easily fitted by models with high α and relatively high β parameters that, when considered alongside our documentary historical evidence, reconfirm an impression of politically fragmented landscapes, where movement is restricted (e.g. warfare, political instability, which result in higher β), and most population is concentrated in few large centres exerting their influence over their surrounding rural hinterlands (higher α). In the Khabur Triangle, higher β values indicate less emphasis on movement and travel in comparison with central Anatolia, which could reflect a more heated competition and conflict between the city-states occurring in the area.

The detection of these settlement patterns offers a more quantitative explanation of some processes previously noted by other researchers in more descriptive terms. The spatial interaction model has been extremely useful for identifying possible causal factors behind the growth of certain sites and the shrinkage of others. In the early second millennium BC, both central Anatolia and the Khabur Triangle were politically fragmented into several competing peer polities, and we have just very few examples of larger territorial states kingdoms that briefly imposed their power in those areas (e.g. Šamši-Adad I's kingdom in Upper Mesopotamia and Anitta's kingdom in central Anatolia).

Chapter 6

Landscape-scale Models of Movement and Interaction

6.1 Introduction

The impact of the landscape on past human movement has been widely acknowledged by archaeologists and historians. Reconstructing past movement and connectivity from a static archaeological pattern is always a big challenge, above all in the case of the Old Assyrian trade system, where a heavy role in the interpretative process has been played by the written sources. In the Middle Bronze Age, the existence of established roadways crossing Upper Mesopotamia and central Anatolia is witnessed both by the directional spatial spread of objects and technologies over long distance and by archaeological and textual evidence. A very useful dataset for understanding connectivity systems in Northern Mesopotamia is the network of hollow ways that has been identified and intensively studied in the past two decades (Wilkinson 1993; Philip et al. 2002; Altaweel 2005; Wilkinson et al. 2006; Ur 2003 and 2009; Casana *et al.* 2012; Casana 2013). Recent work by Barjamovic, based on written sources from Assyrian merchants' private archives (Kültepe's lower town levels II and Ib), has done a great deal to shed light on the human landscapes of movement in the early second millennium in Anatolia (2011, 19-51.) Nonetheless, with the exception of the network of hollow ways in the Khabur Triangle, there is, so far, little archaeological evidence of pre-classical roads in central Anatolia and in Upper Mesopotamia. Consequently, some archaeologists have reconstructed past landscapes of movement by using later archaeological remains of roads and archaeological features (e.g. bridges, caravanserais, artefact distributions) as a proxy, with the assumption that the historical networks reflect to some extent the pre-Classical ones. In particular, French (1988 and 1998) was the first to attempt the reconstruction of pre-Classical pathways in Anatolia by employing the later Roman network as a template. Ökse (2007) proposed a model of multi-period roads (from Chalcolithic to Ottoman period) across the Anti-Taurus Mountains by using Roman roads, pottery distributions, archaeological sites locations and the Ottoman caravanserais. More recently, Massa (forth.) in his doctoral project is integrating both archaeological features (Early Bronze Age settlements, Hittite landscape monuments, Roman roads and milestones, ancient bridges and medieval caravansaries) and topographical physical constraints (e.g. slope and impassable terrain) to reconstruct the main axes of movement in Anatolia during the third millennium BC.

At this stage, a legitimate question arises as to why and how should we wish to reconstruct past routes and transport system pertaining to Upper Mesopotamia and Central Anatolia in the early second millennium BC? The answer is simply that it would be useful to think of such routes as developing within a wider context of long-distance trade and communication, ruled by the strategic and economic interests of large political entities and a host of private traders. It is also significant to investigate different levels of inter-regional connectivity, at several spatial scales, by defining specific topographical and cultural enclaves (e. g. upper Khabur basin and Central Anatolia). Related factors affecting (and affected by) past movement behaviours also include human and animal migration, and such routes can be intensively investigated by making joint use of written sources and remote sensed data (e.g. satellite imagery). In addition, infrastructure to assisted movement, such as roads, bridges and ferries, clearly were important at this time, to judge from the written sources (Barjamovic 2011a, 19-51), and we can use a combination of written sources, archaeology, geography, and computational modelling to suggest how these investments might relate to the contemporary social and political setting. Archaeologists often do not know much about the physical layout of ancient routes because transportation did not necessarily require specific infrastructure (e.g. roads, bridges, guard posts, inss, docks or canals), and even if the latter existed, they may not have yielded any evidence. At this point, a researcher can use quantitative and computational methods both to replicate and predict past routes. They can offer useful insights on past movement dynamics and interaction by better handling existing archaeological and textual evidence, suggesting simple models of human decision-making, and comparing the modelling results against the observed data. The advantage of this model-building approach is that it offers a simple tool for understanding what were in reality far more complex interaction patterns and to explain to what extent social or environmental factors could have affected past human movement in central Anatolia and Upper Mesopotamia during the Old Assyrian period.

To summarise, computational modelling is useful for several reasons: 1) for detecting which environmental and social factors could have shaped ancient routes; 2) for suggesting the easiest paths to cross in terms of energy expenditure; 3) for identifying the most frequented routes; 4) for testing sites' accessibility, and 5) for validating the modelled paths with the observed data.

This chapter begins by introducing background information about several different case studies that will then be analysed at two spatial scales: local (i.e. Central Anatolia and the Khabur Triangle) and inter-regional (central/south-eastern Anatolia and Upper Mesopotamia combined). In section 6.2, an overview of the available archaeological, geographical and textual data will be offered, and their respective limitations and potential for modelling past movement landscapes in my study area will be considered. Then, in the section 6.3, I will introduce and explain several computational modelling approaches that provide complementary spatial techniques for understanding past landscapes of movement and interaction. In the second half of this chapter, the modelling results will be discussed. More precisely, in section 6.4, I will investigate past human movement and interaction at a more local scale, while in section 6.5 and 6.6, I will respectively assess the Assyrian merchants' routes from Aššur to Kaneš, and the spatial structure of the trade network set up by the Assyrians in Upper Mesopotamia and central Anatolia.

6.2 Natural and Human-Modified Landscapes of Movement

6.2.1 Case studies

For the purpose of this chapter several different scales of study area have been chosen. The first scale considers the two well-defined sub-regions that have already been introduced and described in the section 5.2 of the previous chapter: central

Anatolia and the Khabur Triangle. These two sub-regions have been chosen to understand how different geographical settings (a mountainous inland area with large intermountain river valleys against an open plain tableland) contributed to the development of local dynamics of movement and specific patterns of interaction. However, these two areas should not be viewed as fully isolated from each other, as testified by the occurrence of the long-distance commercial system set up by the Assyrians in the early second millennium. From this perspective, an analysis on a broader inter-regional spatial scale aims to elucidate my third research target: what were the likely trade routes used by the donkey caravans starting from Aššur and heading towards the commercial settlements in Anatolia? Therefore, a second and larger scale of analysis will consider the vast geographical area of Upper Mesopotamia (the land between the Tigris and Euphrates Rivers above where those rivers enter the southern Iraqi alluvial basin), northern Syria, and central/south-eastern Anatolia.

In a third stage of this chapter, I will investigate the spatial structure of the trade network set up by the Assyrian and assess how the commercial colonies were distributed. In this case, it can be argued that major centres could be strategically located in areas that were particularly favourable due to the natural sources available (e.g. metals, water, wood, etc.) and their topographical properties (e.g. closeness to natural corridors of movement and mountain passes, commanding view over the surrounding landscape, etc.).

6.2.2 Geographical features and landscape constraints to movement

Dealing with past geographical features and landscape in a given study area is always a challenge as the Iraqi, Syrian and Turkish landscapes of today are different from the ones existing in the early second millennium BC (Moore *et al.* 2000; Deckers and Riehl 2007; Roberts *et al.* 2011). It is almost impossible to control for changes in specific geographical features such as land cover, vegetation types, rivers, lakes, climate conditions, etc., even if we understand the broad patterning. As a consequence, a researcher should prioritise simple and general models that assess the ease/difficulty to cross specific areas of the landscape, based simply on topography and physical barriers (e.g. rivers, lakes, marshes, etc.). With similar motives, the first person to point out how topography could have shaped the main axes of movement in Anatolia was W. M. Ramsay (1890, 51) more than a century ago. Of course, this statement could be true for any given landscape characterized by a marked rugged topography such as Anatolia, but is by contrast far less true for flat and open areas such as the Syrian and Iraqi Jazira (the area between the Tigris and Euphrates Rivers). The uneven topography of Anatolia, characterized by high mountain chains and intermountain alluvial valleys, could have considerably affected human and animal movement. Travellers could bear in mind specific geographical features (e.g. river crossings, fords, bridges, water availability, mountain passes, marshes, deserts) while undertaking a journey in the area (Barjamovic 2011a; Massa, forth.). In addition, human movement could be affected by a variety of social and cultural factors (e.g. taboo zones, wars, customs, brigandage, taxation issues, etc.) as it is worth stressing the obvious point that people think strategically in many instances and do not respond like automata to external environmental stimuli (Wheatley 1993, 135; Llobera 2000, 72). Given these assumptions, below I look to provide a general overview of the geographical features that could have shaped the movement in Upper Mesopotamia and central Anatolia.

Anatolia is characterized by a varied landscape, where some regions are good for human settlement and others are more difficult to settle. Massa (forth.) has recently pointed out that most of Anatolia, given its rugged topography, is over 500 m asl and that at least 30% of its area is not particularly suitable for agriculture (farming was possible without major terracing on slopes measuring up to 10-12 degrees; see Bevan *et al.* 2003, 220-222; Posluschny *et al.* 2010). In central Anatolia, an area bounded to the north and south by the Taurus and Pontic chains, movement could have been funnelled into wide alluvial valleys separated by low mountain ranges, while large rivers such as the Kızılırmak and Delice Rivers could have played as political and physical boundaries (Massa, forth.). In the second millennium BC most of the inland lakes in the Anatolian plateau shrank significantly and were replaced by mud flats and salt swamps (Yakar 2000, 17; Omura and Kashima 2002). The drastic reduction of water levels of these lakes caused less rain and drier air in the plateau and in the mountain chains. The Taurus Mountains represent a big obstacle to human movement between Upper Mesopotamia and central Anatolia that, nevertheless, could be channelled into a limited number of mountain passes in the Eastern Taurus and in Cilicia (the "Cilician gates"). These passes occur at high altitude (between 1500 and 2000 m asl) and are difficult to cross during the winter season.

Upper Mesopotamia can be divided into two different geographical sub zones: 1) Syrian and Iraqi Jazira and 2) the southern Turkish hilly flanks. The Syrian and Iraqi Jazira, is a flat area of intermediate annual rainfall (300-400 mm), where dry-farming is possible in the north and western part and impracticable to the south and east. Paleo-environmental evidence shows moister climatic conditions characterized by heavy rains and high floods in the Euphrates and the Khabur in the first half of the second millennium BC (Cole and Gasche 1998, 9; Wick *et al.* 2003; Deckers and Riehl 2007; Deckers and Pessin 2010). This region is generally a flat plain area with no particular topographic constraints to human movement, where travel could have been hindered to some extent by the main rivers such as the Euphrates, the Khabur, the Wadi Jaghjagh, and the Balikh. The southern Turkish area is moister, with rainfall usually in the 400-500mm range. The hilly topography generally funnels movement along wide alluvial valleys.

In Upper Mesopotamia, a major constraint to the east-west journey of the Assyrian merchants' caravans could be represented by the Euphrates Rivers, which could play both as natural and political/cultural boundary. A few Old Assyrian slave contracts show that crossing the Euphrates from Anatolia involved entering a foreign land (Veenhof 2008a, 18). There are several possible crossings of the Euphrates between Bireçik and the area ca. 150 km upstream, where the Euphrates Gorge begins. Textual evidence represents a privileged tool to detect the location of possible crossings along the Euphrates, but unfortunately the location of most toponyms is uncertain. Barjamovic (2011, 217-219) has identified, at least, four crossings on the eastern bank of the river stretching from the area around Malatya to Gaziantep. From the written sources, it seems that the area of Hahhum hosted the main crossing of the Euphrates (Veenhof 2008a, 8). This centre, located at or near Samsat Höyük, was the seat of an Assyrian *kārum* and, therefore, an important market town and stop along the route to Anatolia (Forlanini 2004, 141; Veenhof 2008a, 8; Barjamovic 2011a, 87-91).

6.2.3 Archaeological features

There is little evidence for pre-Classical roads in Upper Mesopotamia and central Anatolia, with the exception of the network of hollow ways, which stretches for a total of over 6000 km in the Iraqi/Syrian northern Jazira. The only available evidence for Anatolia come from written sources and the finding of wheeled vehicle models at Abamor Höyük, Acemhöyük, Alişar Höyük, and Kültepe (see Arık 1937; Littauer and Crouwel 1979, 43-72; Dercksen 1996, 64-67; Gorny 2001; Özgüç 2001; Kulakoğlu 2003; Barjamovic 2011a, 19-21;). The evidence of wheeled wagons carrying heavy loads may, therefore, suggest the existence of proper roads built for easy movement. Other important features for the road network were bridges, ferries and fords crossing the rivers. Unfortunately, there are no remains for bridges that presumably were wooded constructions that have not survived. There are also some Old Assyrian texts recording the location of bridges, crossings, ferries and fords in central Anatolia (Fig. 147).

One important role in the structure and logistics of trade was surely represented by a system of inns that was as essential as the roads to guarantee the flow of goods and caravans over long-distance at an acceptable speed. From this perspective, an important contribution has been recently offered by Barjamovic (2011, 34-37, table 5; see Fig. 148) who has identified the location of some inns attested in the Old Assyrian texts. The inns played a key part in the logistics of trade as they provided water, fodder and food that each Assyrian donkey caravan required. In fact, the availability of water was an important issue for the merchants undertaking a long-distance journey from Aššur to Anatolia, and vice versa. In line with this, it is important to point out that donkeys have more endurance and tolerate reduced food and water better than other domesticated animals, except the camel (they can go for 3-4 days without water; Yilmaz 2012, 69-71). In Upper Mesopotamia, in the early second millennium, the situation may have been less difficult, with moister climatic conditions than today (Cole and Gasche 1998, 9; Wick *et al.* 2003; Deckers and Riehl 2007; Deckers and Pessin 2010).

6.2.3.1 Hollow ways in Upper Mesopotamia

In the Khabur Triangle, a major source of evidence is represented by the hollow ways: informal landscape features (tracks or paths) generated by human or animal movement (Wilkinson 1993, 1994, 2003 and 2007; Ur 2003 and 2009; Altaweel 2008a). The hollow ways are broad and shallow (generally 60-120 m wide and 0.50-2 m deep) linear depressions in the landscape that could have been generated by the continuous movement of people and/or animals (Ur 2004, 102). Despite their size, these features are very difficult to detect on the ground: the largest ones can be visible with specific light conditions and oblique angles or after extraordinary atmospheric events such as a flooding (Fig. 149). As a consequence, a major contribution in detecting hollow ways has been made by aerial photography and satellite imagery, especially declassified CORONA satellite images. The CORONA program, in operation from 1959 to 1972, was launched by American intelligence with the purpose of monitoring sensitive strategic areas by spy-satellites.[29] High-resolution CORONA satellite images have been widely used in the Middle East to detect small-sized unmounded sites (< 1 hectare), ancient tracks and irrigation channels (Philip *et al.* 2002; Wilkinson *et al.* 2006; Casana and Cothren 2008; Casana *et al.* 2012; Casana 2013).[30] The available data have allowed the mapping of about 6000 km of tracks in the Upper Khabur valley (Ur 2010b, 76) highlighting a busy landscape characterized by interconnecting and overlapping tracks (Fig. 150). The hollow ways starting from the archaeological sites show a radial pattern. That may be due to the fact that the area around the sites was intensively cultivated and that the movement of farmers, shepherds and their flocks were constrained by the presence of agricultural fields (Ur 2009: 194). In fact, at a certain distance from the settlement (generally 3-5 Km) the hollow ways gradually fade out because they reached the limits of the cultivation zone and the start of the pastoral lands, where movement was not constrained by particular fields. In this case, the analysis of the radial pattern of hollow ways surrounding a settlement may be useful for estimating

[29] The declassification of U.S. Corona satellite images by the U. S. government in 1995 and consequently their open dissemination to any user without expensive prices (about 30 $ per scene), the high resolution of these images (2 metres), the almost total coverage of western Asia, make this kind of data an essential tool for the scholars dealing with landscape Archaeology in the Near East.

[30] On the website of the the University of Arkansas' Center for Advanced Spatial Technologies (CAST) it is possible to have access to a database of geo-referenced CORONA satellite images covering most of the Middle East: http://corona.cast.uark.edu/.

the size of agricultural catchments (Fig. 151). If we look at the map showing the hollow ways detected by using CORONA satellite images, we can see that these tracks not only connected the settlements with each other, but also constituted segments of long “highways” throughout the Upper Khabur basin that would suggest the presence of specific interregional routes used for long-distance journeys (Fig. 150). Direct dating of hollow ways is still a difficult task, but relative dating is possible when stratigraphic relationships exist among landscape features and when the geoarchaeology of hollow ways has been examined (see Wilkinson *et al.* 2010). An indirect way for dating these tracks can be their association with the sites and the recent archaeological surveys have demonstrated that there was an intense phase of hollow ways formation in the Khabur triangle in the third millennium BC (Ur 2003; Ur and Wilkinson 2008). Because a road can live beyond the time of its construction, and many 3rd millennium hollow ways are associated with multi-period sites, we can postulate that the tracks related with Middle Bronze Age sites could also have been used in the 2nd millennium BC. The network of hollow ways in the Khabur triangle thus probably played an important role at the local scale by favouring the links between the settlements in the area, and on an inter-regional scale by channelling movement through different geographical and political areas.

6.2.4 Textual evidence and inter-regional trade routes

In the past few decades, there have been several attempts to trade routes and itineraries across Upper Mesopotamia and Anatolia (Goetze 1953 and 1964; Hallo 1964; Nashef 1987; Beitzel 1992; Oguchi 1999; Forlanini 2006; Barjamovic 2011; Kolinski 2014). Generally, those attempts aimed to reconstruct the main axes of movement from the same starting point: Aššur. Forlanini (2006), on the basis of Old Assyrian texts, proposed two roads from Aššur to Anatolia: a southern one which turned west after passing Qaṭṭarā (Tell Rimah[31]), proceeded to Apum (Tell Mohammed Diyab), crossed the northern Jazira and reached Hahhum (Samsat Höyük); and then a northern one that, after passing Jebel Sinjar, went north along the west bank of the Tigris, continued through the area south of Ṭūr ‘Abdīn and reached the area of

[31] Dalley (1984) and Joannès (1996) identify this site as ancient Karana.

Viranşehir, from where it headed for the Euphrates (Fig. 152). With this attempt, the main difficulty is in identifying early second millennium BC sites, contemporary with Kültepe's lower town level II period. [32] Given this issue, Kolinski recently used the earliest evidence of Khabur Ware to reconstruct the Assyrian caravan routes out of the Khabur Triangle by identyfing some ancient toponyms with archaeological sites (Kolinski 2014, 11-34). Beitzel (1992), analysing written sources from Mari's royal archives, proposed that the Assyrian merchants from Aššur turned west to the upper Thartar, passed along the southern edge of the Jebel Sinjar, then turned north to Hasseke, crossed the Khabur Triangle and reached Urfa. From this point, they crossed the Euphrates either via Samsat Höyük or via Birecik (Fig. 152). Much earlier, Hallo (1964) had traced the trade routes of the Old Assyrian merchants on the basis of the so-called "Old Babylonian" itinerary describing a round-trip from Larsa to Emar dated to the kingdom of Rim-Sin of Larsa (1822-1763 BC). According to him the routes perhaps ran from Aššur to Ekallatum, then stretched north along the Tigris, where either it continued until Šubat-Enlil or turned on the way west to Apqum (Tell Abu Maria). From this point, the route crossed the upper Khabur basin via Urkeš (Tell Mozan) until Harranum (Fig. 152). Recently, Barjamovic (2011) has detected several trade routes by analysing a large corpus of "itineraries" occurring in the Old Assyrian merchants' clay tablets. With the term "itineraries" he means texts depicting a physical movement between ancient toponyms. Thanks to this work he indicated the cities of Hahhum, Zalpa and Uršu as the main gateways crossed by the Assyrian merchants to access central Anatolia from Upper Mesopotamia (Barjamovic 2011, 216-218; Fig. 152). He also traced the main Assyrian routes to Purušhaddum from Durhumit ("Copper route") and Kaneš (Barjamovic 2011, 241, 251, 341-348; Fig. 152) and the so called "Narrow track", a smuggling route to the east of Kaneš crossed by the Assyrian Merchants from Hurama to Durhumit via Kuššara and Šamuha (169-179; Fig. 152).

[32] In Upper Mesopotamia, the Khabur Ware contexts that can be precisely dated by textual evidence are contemporary with Kültepe's lower town level Ib period (ca. 1835-17th c. BC). Instead, there are few sites yielding deposits of this kind of pottery, which can be attributed to Kültepe's lower town level II period (ca. 1970 – 1835 BC).

6.3 Computational methods

Computational and quantitative approaches for modelling past movement dynamics in archaeology have boomed in the past decade (for a broad review see McCoy and Ladefoged 2009; Bevan 2013), with the use of a variety of different spatial techniques being explored (e.g. Bevan 2010 and 2011; Bevan and Wilson 2013; Evans *et al.* 2012; Rivers *et al.* 2013; Herzog 2012 and 2013; Howey 2007 and 2011; Murrieta Flores 2012; Verhagen *et al.* 2013; Wheatley *et al.* 2010). Models for explaining past human behaviours can be more or less complex in their design with more or less parameters to consider. For archaeologists and historians, it is tempting to build models that fit as closely as possible to the observed empirical data, providing explanations that address which factors could have affected and determined a specific social process under investigation. With respect to the human travel, in a process of model building a researcher should ideally consider both environmental and social factors that could hamper or ease movement (see discussion in Llobera 2000, 71-75; Bell *et al.* 2002, 174; Palmisano 2013b, 779-781). It is from this perspective that many commentators criticise simpler models of movement based exclusively on topography and a few geographical (e.g. rivers, lakes, presence of marshes) and archaeological features (e.g. bridges, roads), asserting that these underestimate the impact of social factors and are too environmentally deterministic (see Wheatley 1993). On the other hand, topographical data, in the form of elevation and relief, are less prone to substantial changes over millennia, while other geographical features (e.g. vegetation, rivers, lakes, etc.) and socio-cultural factors (political boundaries; alliances, taxation control, safety issues, wars) are more sensitive to change over a short time. Therefore, almost counter-intuitively, the best answer when faced with the multiple problems and limitations of the original archaeological dataset is to design very simple models, as these have the advantage of being easy to understand and test because a limited number of variables are involved.

With this agenda in mind, the next section will introduce several quantitative and computational methods that can be applied to my case studies to address the three different research goals indicated in section 6.2.1.

6.3.1 Least Cost Surfaces, Paths and Corridors

Cost surfaces and so-called 'least cost paths' are two well-known and established computational methods for exploring movements and tracing routes, mainly based on topography and landscape features (see Stančič *et al.* 1997; Harris 2000; Howey 2007; Bevan 2010). The methodological process requires three steps: 1) defining a set of movement costs for each cell in a raster map; 2) creating a cost surface map by accumulating movement costs out from a fixed point of departure A; 3) and tracing a route requiring the lowest movement cost from another point B to the point of departure A.

The first step consists of defining a grid (known as cost-of-passage map or friction surface), where each cell has a value assigned which reflects the movement cost of traversing that cell. From this map it is possible to generate both accumulated cost surfaces and least-cost paths. Researchers should carefully assess what criteria to include in this model for generating friction surfaces (Palmisano 2013, 775-776). For example, generating a friction surface based on land-cover vegetation requires assigning a unique cost value for each land-cover category. Put simply, the grid cells representing forested land will have higher movement cost values than cells representing grassland. After defining a cost-of-passage map, it is possible to generate a cost surface, which is a model in which each pixel in the raster map is assigned the cumulative cost required to reach that cell from the chosen point of origin (Bell and Lock, 2000, 86). This accumulated cost surface map is generated from the base cost of passage map by applying a spreading function (see Fig. 153A-B). The accumulated cost surface from origin A then provides a base map to create multiple least-cost paths (from origin A to any chosen destination B), which are useful for identifying ancient routes and reconstruct past connectivity systems (Fig. 154; Stefanakis and Kavouras 1995, 243-247; Collischonn and Pilar, 2000).

One limitation of this kind of approach is that only one possible path is identified, although several different pathways with comparable movement costs might exist between A and B. A challenge in modelling past movement dynamics is that individuals did not exclusively use only an optimum route, and creating a model focused on generating lowest movement cost routes fails to incorporate variation in individual behaviour. One way to avoid modelling just one least cost path is to produce a Conditional Minimum Travel Cost (CMTC) grid, which suggests a least-cost corridor (LCC) of travel (Pinto and Keitt 2009, 252-256). The method for constructing such a corridor is to generate cumulative cost surfaced from the start site (Fig. 153A) and another one for the destination (Fig. 153B), then, combine the two as follows.

CMTC = (Cumulative cost from A + Cumulative Cost from B) / 2

The resulting grid can then be masked to exclude cells with values larger than the first decile (the value above which 90% of the population lie; Fig. 153C). This threshold is arbitrary but allows for the extraction of only low CMTC values and enables the identification of least-cost corridors (LCC). Modelling the presence of specific physical or natural barriers (e.g. political boundaries, rivers, defensive walls and earthworks, lakes, etc.) require the generation of friction surfaces in which cells at such locations are either impossible or very difficult to traverse (Fig. 155).

6.3.2 Electric Circuit Theory

Several ecological researchers, recognizing the inability of least cost paths (LCP) to model multiple pathways, have also recently proposed a new circuit-based approach, adapted from electrical engineering, to model landscapes of movement and connectivity (McRae 2006; McRae and Beier 2007; McRae *et al.* 2008; Shah and McRae 2008; McRae *et al.* 2012; Pellettier *et al.* 2014). The kinds of least cost path modelling described in the previous section implicitly assume that travellers have a full knowledge of the landscape where they are traversing and consequently operate on the assumption that travellers will be always able to choose the best single path based on their landscape knowledge (Howey 2011, 2525). Even though, people had deep knowledge of a landscape, a variety of unpredictable natural (e.g. flooding, snow, fire, avalanches) and social (wars, brigandage) factors can impede the preferred single travel routes and make safe routes dangerous or closed. In fact, LCP tends to imply single acts of decision-making, not aggregate patterns of movement. Nevertheless, in modelling past human movement (e.g. Assyrian caravan routes), it is not always problematic to assume, as least cost paths do, that travellers will choose the easiest path on the basis of the knowledge of the area they were crossing. For this reason, Howey (2011) has recently pointed out that electric circuit theory is a complementary tool to traditional LCP modelling, which allows archaeologists to approximate the complex matrix of accessibility and isolation in a given landscape (see Bevan and Conolly 2013, 161-163).

The use of this approach is justified by the previous work of Doyle and Snell (1984) that has demonstrated a precise relationship of current, voltage and resistance in electrical circuits with the theory of random walks. From this perspective, electric circuit theory can be used to represent landscapes as conductive surfaces and provide measures of accessibility (low resistance) and isolation (high resistance) for different habitat patches, as well as to identify natural corridors of movement. Electric circuits are, therefore, defined as a network of nodes connected by resistors through which current (I) flows (Fig. 156A). According to Ohm's law, the amount of current (I) flowing across a resistor depends on the voltage (V) applied and the resistance (R):

$$I = V/R \tag{1}$$

Therefore, the lower the resistance (R), the greater is the flow of current (I) per unit voltage (V) in a circuit (McRae *et al.* 2008, 2722). The effective resistance (R) between nodes is the resistance of one or more cells to the flow of current. How the effective resistance changes in a circuit can be shown by several examples in Fig. 156B (1-3). Where the numbers of resistors connecting two nodes increases, the effective resistance decreases. In fact, two and three connecting resistors in parallel respectively decrease the effective resistance between the nodes *a* and *b* by half and 2/3 respectively (Fig. 156B:2-3).

Predicting connectivity using circuit theory requires translating spatial data sets into a circuit, where we can then model the behaviour of current flow over the occurring space with, for instance, the steepness of slope as a form of resistance. In fact, a circuit theory model can easily be built for a raster map of a landscape, in a manner similar to the one necessary for cost surfaces and LCP analyses (see previous section). Analysing a landscape raster grid requires first assigning resistance values to each cell grid based on the relative impediment to movement. Basically, this step consists of generating a friction surface so that grid cells with lower resistance values have higher probabilities of passage, while cells with higher resistance values have lower probabilities of being traversed. Landscapes are, therefore, converted into grids and circuits, where cells with finite resistances are converted into nodes (grey), whereas cells with infinite resistance (i.e., those representing complete barriers, black) are dropped (see McRae *et al.* 2008; Fig. 157). Cells with zero resistance are converted into nodes that are thus connected to all other nodes having zero resistance (white). Therefore, in a given landscape, the cells with finite resistance values represent the impediment to movement, while the cells with infinite resistance may represent geographical and archaeological barriers (e.g. rivers, lakes, walls, etc.). The cells with zero resistance may represent specific settlements or areas that a practitioner wishes to connect. The program Circuitscape provides a convenient interface for calculating the passage probability across a given landscape.[33]

6.3.3 Network Analysis

Looking at the world in terms of network connectivity is now a popular approach, favoured both by its visual conceptual simplicity and by its analytical and interpretative power. Network analysis is useful for interpreting patterns of relationships among any kind of actors (e.g. individuals, objects, communities, cities, states, etc.). Network analysis adopts specific techniques coming from graph theory (Harary and Norman 1953; Barnes and Harary 1983). A network consists of a set of vertices (or nodes) and a set of lines (also defined as arcs or edges) between pairs of vertices (Nooy et al. 2005: 6-7). Lines can be directed (arcs) or undirected (edges), depending on whether the relationship between the vertices is one-way or two-way (see Fig. 158). Many commonly used networks are one mode (i.e. they consider only one kind of connection between the nodes), unweighted (all the lines connecting the vertices have the same value) and undirected (passage from A to B and from B to A is equivalent). Unlike other disciplines, network analysis has only recently become popular in archaeology (e.g.

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[33] Circuitscape is a free, open-source software package, which applies algorithms from electronic circuit theory to predict connectivity in a given landscape. McRae, B.H., V.B. Shah, and T.K. Mohapatra. 2013. Circuitscape 4 User Guide. The Nature Conservancy. http://www.circuitscape.org.

Broodbank 2000, 180-210; Graham 2006a, 2006b and 2009; Collar 2007 and 2008; Sindbæk 2007; Isaksen 2008; Evans *et al.* 2008 and 2012; Hart 2011; Evans and Rivers 2012; Menze and Ur 2012; Bevan and Wilson 2013; Rivers *et al.* 2013; see also Brughmans 2013 for a broad review). One key issue of the application of this technique in archaeology is the degree of uncertainty to which a network is sensitive in the location and number of defined nodes and in the connection matrix (in terms of which nodes are connected, in which direction and with what degrees; see Zonin 2011). All of these aspects can be explored by investigating different scales of interaction, by exploring different parameters and by modifying the general structure of the network (e.g. slightly moving existing nodes, altering the connectivity, adding or subtracting nodes). For the purposes of the present chapter I will make use of some network centrality measures that have been widely applied in archaeology (Bernardini 2007; Isaksen 2007 and 2008; Mizoguchi 2009; Phillips 2011; Mills *et al.* 2012; Verhagen *et al.* 2013): degree centrality, closeness centrality, and betweenness centrality. The degree centrality of a node is the number of relationships incident with it (Fig. 159). In an undirected network, the degree of a node indicates the number of edges incident with it, while in a directed network the indegree represents the number of arcs that a node receives. "The closeness centrality of a vertex is the number of other vertices divided by the sum of all distances between the vertex and all others"(Nooy *et al.* 2005, 127; Fig. 159). Put simply, the closeness centrality of a node measures the total distance between a given node and all other nodes so that the closer a node is to all other nodes, the higher its centrality will be. "The betweenness centrality is the proportion of all shortest paths between pairs of other nodes that include these nodes" (Nooy *et al.* 2005, 131; Fig. 159). Therefore, from a spatial perspective, the betweenness centrality of a settlement depends on its role as broker in web of contacts among other actors in the network.

6.3.4 Spatial Interaction Model and Areas of Interaction

One of the common outputs from the Spatial Interaction Model introduced in the previous chapter is a Nystuen-Dacey graph (N-D) derived from the simulated flow matrix S_{ij}. Nystuen and Dacey (1961) described a method of deriving a graph *G* of relationships between activity sites in a regional system, given a set of flows (goods and people) S_{ij} between any pair of sites i and j. These relationships represent the subordination of some sites with respect to others, as determined by the structure of their interaction. The construction of the graph is relatively simple:

1. For each site i, the destination of its largest flow is found; that is, j for which S_{ij} is maximal.
2. If j is a smaller site than i (so i's main flow is to a smaller site), i is regarded as being independent and no subordination relation is given.
3. If, on the other hand, j is larger than i, i is determined to be subordinate to j and a directed edge from i to j is added to G.

After carrying out this process, we have a graph of sites, for which each site is either independent or has exactly one link to another site (see Fig. 160). The graph can then be analysed by considering either graph-theoretical properties, such as the number of inward links at each site, or by examining the characteristics of the links themselves, such as the physical distance over which they run. A Nystuen-Dacey (N-D) graph is useful for identifying the "degree of contact between city pairs and it provides a quantitative basis for grouping cities" (Nystuen and Dacey 1961, 29). This allows a practitioner to assess the direction and magnitude of flows S_{ij} (of goods and people) both on local and regional scale and to identify dominant nodal centres that are the main collectors of the flows from the surrounding hinterland (Nystuen and Dacey 1961, 31). Such a method, therefore, can be useful to trace the spatial distribution of flows between pairs of sites and consequently to identify areas and sub-areas of interactions in a given region.

6.4 Connectivity and Interaction at the Regional Scale

In this section, I will make use of Nystuen-Dacey (N-D) graph resulting from scenario 2 of the spatial interaction model (see section 5.4.3.2 in the previous chapter) to understand areas of interactions on different spatial scales in two different sub-regions: central Anatolia and the Khabur Triangle. I will, therefore, apply graph theory approach to N-D network to assess the network centrality of settlements, detect main regional urban hubs and the interaction with their respective surrounding rural hinterlands on smaller local scales. To do so, I will first perform some modifications to the original structures of the N-D network outputted by the spatial interaction model. As I formerly stated, the Nystuen and Dacey (N-D) graph shows the amount of flow S_{ij} between any pair of sites *i* and *j* in terms of hierarchical relationship. Therefore, this network is directed (each line connecting nodes is an arc) and each arc is weighted according to flow value between pairs of nodes. Because N-D network shows all possible connections between pairs of nodes, its original structures outputted from spatial interaction model results as a cloud of thousands of arcs between nodes in our two study areas central Anatolia and the Khabur Triangle. As result, even far away pairs of nodes will be connected by arcs with flow values very close to 0. In order to avoid such a problem, I will apply a cut-off threshold to arc values. Hence, arcs having values below this threshold will be dropped from the analysis, allowing me to focus on more intense flows S_{ij} between pair of nodes and assess the strength of interaction between settlements on the basis of the threshold value applied. For the purposes of my research objectives, I will adopt the values 1 and +1 standard deviation as thresholds (see Figs. 161 and 162 for assessing how the N-D graph changes according to different threshold values). Given these assumptions, I will first calculate the network centrality of settlements in both central Anatolia and the Khabur Triangle, and then I will assess possible clustering of nodes in sub-networks or sub-areas of interactions.

6.4.1 Network Centrality and Clustering

The first aim of this section is to identify which sites could have played a pivotal role in the network of flows S_{ij} (of goods and people) occurring in central Anatolia and the Khabur Triangle. To do so, I will measure network centrality of nodes in two different scenarios (see the properties of graphs in Figs. 161 and 162) : 1) a N-D graph with arcs (or edges) flow values higher than 1; 2) a N-D network with flow values higher than +1 standard deviation. This will allow me to assess different intensity of interactions on different spatial scales within my two case studies. In the scenario 1 I calculated the indegree of sites in a directed N-D network. The results in central Anatolia (Fig. 163) and the Khabur Triangle (Fig. 164) unsurprisingly match with the results outputted in the scenario 2 of the spatial interaction model for both study areas (Figs. 142 and 143):

only few main urban centres collecting the flow (of goods and people) from the surrounding hinterland. The N-D graph is useful because provides a visual inspection of the spatial distribution and magnitude of interactions between main nodal centres and secondary settlements. In central Anatolia, Bögazköy seems to play a pivotal role by receiving significant flows S_{ij} even from distant settlements. Unlike central Anatolia, in the Khabur Triangle the interactions occur on a smaller scale and a shorter distance. In addition, the western part of the Khabur Triangle shows many isolated and unconnected nodes and a separated component[34] around Tell al-Fakhkhariya. The limit of a directed N-D network is that our analysis is limited to assess the strength of interaction between pairs of nodes so that the network diameter is one.[35] As our network may represent the flow of goods and people as a result of interaction (e.g. taxes, trade, migration, agricultural surplus supply) between sites, it is worth also assessing how sites interact at different spatial scales and what are the strongest links. In addition, a node could have played a crucial role as an intermediary to the transmission of goods in the network. Those two aspects can be assessed by respectively calculating the closeness centrality and the betweenness centrality in our N-D graph. To do so, we need to convert it into an undirected graph, where the ties (edges) between nodes are two-way.

Figs. 165 and 166 show closeness centrality in both central Anatolia and the Khabur Triangle. In the latter one it is unsurprising to note that sites in the middle of the area are more central within the network, with the exception of five sites around Tell al-Fakhkhariya that belong to a separate component. On the other hand, in central Anatolia the pattern differs and there is not a continuous gradient of change to the far periphery of the region, but a tendency to generate sub-regional spheres of interaction that may be explained, to some extent, in terms of topographical isolation and terrestrial connectivity. The betweenness centrality (Figs. 167 and 168) in both study areas match with the spatial interaction model's outputs (Figs. 142 and 143). This shows that the major urban centres were not only collectors of flows but also pivotal hubs to the transmission of goods in the network. If we use a Markov cluster algorithm

[34] A component is a portion of the network where all nodes are connected by at least one line (arc or edge).

[35] The network diameter is the largest distance, in terms of lines, between two nodes.

for detecting the clustering of nodes, the first step is to use a weighted directed N-D network. This will allow me to turn the graph into a probability (transition) matrix, where the values of arcs represent the probability of goods and people to flow from a node to another one. The resulting outputs by using the Markov cluster algorithm show two different situations for central Anatolia and the Khabur Triangle (Figs. 169 and 170). In central Anatolia we have 6 different clusters, where the biggest one encompasses almost all the area. This could be due to the role played by Bögazköy in the model, which has strong ties with far away sites. Other small clusters result around Yassihöyük (Ankara), Varavan Höyük, Altilar Höyük; Açemhöyük and Kayalipinar Harabesi. This method could be useful to roughly estimate possible areas of interaction on larger scale and longer distance. It is interesting to notice that all other clusters are located beyond the Kızılırmak bend, which could suggests that this river could have acted both as a physical and cultural/political barrier. On the other hand, in the Khabur Triangle the resulting scenario appear more fragmented: twelve less-defined different clusters distributing around the major centres. These could reflect the higher degree of competition among city-states in a so intensively inhabited area.

Now, in this second scenario, I will perform the same analysis carried out above by making using of a higher arc (or edges) value threshold (+1 standard deviation) for the N-D network in both central Anatolia and the Khabur Triangle (see Figs. 161 and 162 for the thresholds used in this second scenario). This will allow me to assess if and where stronger interaction occur on smaller local scales. In this second scenario the N-D graph for central Anatolia and the Khabur Triangles will be respectively composed of 240 and 120 nodes and will be divided into 2 and 5 components. Of course, the Indegree of the main nodal centres decreases in comparison with the one in the first scenario as there are fewer vertices in the N-D network. Nevertheless, the general pattern matches with the outputs from scenario 1 for both case studies (Figs. 171 and 172). The closeness centrality results differ with the previous scenario as in both areas there is a more marked general tendency to divide the networks in sub-areas. In central Anatolia we can detect two bigger sub regions with high closeness centrality: one in the northern part around Boğazköy and Kösele Tepesi, and one in the central part where Yassihöyük is located (Fig. 173). In the Khabur Triangle two bigger sub-regions are in the areas around Tell Brak and Tell Leilan (Fig. 174). As for the indegree, the betweenness centrality in both areas roughly matches with the outputs obtained in the first scenario (see Figs. 175 and 176). The Markov clustering algorithm's outputs show a different situation in central Anatolia in comparison with the results from scenario 1. Central Anatolia is now divided into nine different sub-regions and now Boğazköy's cluster is completely confined within the Kızılırmak bend (Fig. 177). This scenario shows a blurry spatial distribution of strong local interactions between main urban centres and their respective hinterlands. In the Khabur Triangle, the resulting pattern is similar to the one detected in the first scenario (Fig. 178).

6.4.1.1 Hollow ways and connectivity in the Khabur Triangle

We can also apply network centrality measures to the palimpsest of hollow ways occurring in the Khabur Triangle. These archaeological features represent a privileged way to understand connectivity in the area. The analysis carried out in this section starts from the assumption that hollow ways created in the third millennium BC were probably still used in the early second millennium BC. In fact, the hollow ways that could be originally dated to the Middle Bronze Age, on the basis of the occupation period of the sites from which they depart, are few and, therefore, insufficient for this kind of analysis (see Fig. 179). Thus, the existing hollow ways have been converted into an undirected network, where the nodes (settlements) are connected, where possible, by edges (hollow ways). The resulting network is composed by 200 nodes connected by 248 edges. The degree of nodes show high values for the main urban centres in the area: Tell Brak, Tell Muhammed Diyab, Tell Leilan, Tell Farfara, and Tell Hamidiya (Fig. 180). Unfortunately, we do not have preserved hollow ways around Tell Mozan. Even so, where the preserved hollow ways allow calculation of a network centrality measure, the resulting pattern shows that the biggest urban centres in the area have high degree values. This confirms that hollow ways could have been the main axes on which the flow of goods and people transited and the results offer good evidence of the interaction of the main nodal centres with their surrounding rural hinterland (villages and hamlets). The closeness centrality unsurprisingly show that sites located in the middle of the area appear to be more central and, hence, there is a continuous gradient of change to the far east and west of the Khabur Triangle (Fig. 181). The betweennes centrality values show that the main urban centres such as Tell Leilan, Tell Farfara and Tell Brak also act as crucial go-between hubs in the connectivity system (Fig. 182). In particular, it seems that a continuous axe of interconnected hollow ways departs from Tell Brak and proceeds to Tell Leilan via Tell Farfara.

6.4.2 Landscape terrestrial connectivity

A final step of this section consists in assessing if the topography of the landscape could have funnelled the movement along restricted number of paths and, hence, shaped the interaction dynamics of past human communities. To do this, I will create an omnidirectional landscape connectivity map by making use of electric circuit theory (see Pelletier *et al.* 2014). First, I will use as friction surface a slope map derived from the Digital Elevation Model (DEM) of my study area, where each grid cell is assigned a resistance value based on the slope degree.

Then, for both central Anatolia and the Khabur Triangle, I created two pairs of horizontal and vertical parallel strips having zero resistance and used Circuitscape in pairwise option to simulate the flow of current in both west-east (Fig. 183a) and north-south (Fig. 183b) directions (McRae and Shah 2009). Finally, the two resulting current density maps (Figs. 183c-d) were combined by multiplication in order to generate an omnidirectional connectivity map (see Pellettier *et al.* 2014; Fig. 183e). The resulting map in central Anatolia emphasises the most likely sharp corridors (light grey filaments) of connection and suggest that the landscape topography funnels the movement into wide inter-mountain alluvial valleys (Fig. 184). By contrast, the current density in the Khabur Triangle appears uniform and indicates that the landscape could have not funnelled travel into narrow corridors of movement (Fig. 185). By using this omnidirectional connectivity map one question can now be quantitatively tested: were the natural corridors used during the early second millennium? In order to test this research question I measured the distance of the settlements that fall within or close the areas identified as natural corridors. To do so, in each study area, I calculated the movement cost distance of each settlement and random location[36] from the areas

[36] I created as many random locations as the number of settlements in central Anatolia and the Khabur Triangle.

showing the higher current density values (upper 10% quantile). Then, I carried out a K-S test to investigate if the sites are closer to the natural corridors than it could be expected by matter of chance alone. The results show a significant difference (p-value < 0.01) in cost weighted distance (from natural corridors) between settlements and random locations in central Anatolia. This indicates a spatial relationship between settlements and natural corridors and adds one more proof of the fact that, in Anatolia, the landscape shaped dynamics of movement between the Middle Bronze Age human communities. In contrast, in the Khabur Triangle the results of the K-S test (p-value = 0.13) show no significant difference between settlements and random locations in terms of cost weighted distance from natural corridors. Therefore, unsurprisingly the Khabur Triangle's landscape, an open and flat land, may not have affected human travel.

6.4.3 Discussion

In this section I have shown how graph-theoretical approaches applied to Nystuen-Dacey networks represents a valid complement for visual examination of interactions among settlements within a given study area. The network centrality measures applied to N-D networks, with different strength of relationship between nodes, allowed me to detect spatial interactions on both regional and local scales. The results in scenarios 1 and 2 have showed that the major settlements in both central Anatolia and the Khabur Triangle played a pivotal role both as nodal centres collecting flows (of goods and people) from their respective rural hinterland (e.g. villages, farmsteads, hamlets) and as go-between flow of goods between settlements. This latter aspect is emphasized by the presence of several interconnected sub-regions (or networks) developing around each main urban centre, which suggest a two-tiered spatial scale of interaction in a N-D network: 1) main nodal centre connected to its peripheral hinterland; 2) inter-connections between distinct sub-regions. The first kind of interaction can be described as the flow that main urban centres collected by their rural hinterlands in terms of agricultural surplus and work-force. This is quite evident for the Khabur Triangle, where the hollow ways could be interpreted as the main vectors over which goods and people transited between settlements. The second kind of interaction occurs at larger spatial scales and can be explained as trade and political relationship (or influence) among different and competing city-states. In central Anatolia Böğazköy seems to have long distance strong relationships in the area within of the Kızılırmak River, which could have played as physical and political boundary. Other smaller sub-regions emerge around the other main urban centres to the south of the Kızılırmak and of the Delice Rivers: Acemhöyük, Altilar Höyük, Kültepe; Sevket Tepesi; Varavan Höyük, Yassihöyük (Kirşehir), and Yassihöyük (Ankara). In the Khabur Triangle the situation is more fragmented and the areas is divided into smaller sub-networks and isolated components. This is the results of a more heated competition and conflict between the polities occurring in the area, as already showed by the higher *β* values in the spatial interaction model (see section 5.4). In Anatolia past human dynamics and interactions could have been strongly shaped by the landscape, where the movement was presumably funnelled into narrow natural corridors in the wide alluvial valleys. By contrast, in the Khabur Triangle the landscape (in terms of terrain slope) seems to not have affected the past human movement and, instead, the flow of people, animals and goods could have been funnelled into the hollow ways. Of course, given the volatile political situation in the area, the routes could have been more circuitous and shifted considerably over short periods (see Branting *et al.* 2013, 143).

6.5 Long-distance trade routes across Upper Mesopotamia and Anatolia

In this section, I will propose a simple model built on the ease/difficulty of crossing specific areas of the landscape in terms of terrain slope and physical natural barriers (e.g. rivers, lakes, impassable terrain) in order to understand to what extent environmental factors influenced Assyrian caravans routes across a much wider region that the sub-areas discussed so far. The base dataset used for predicting routes between Aššur and Kaneš is a digital elevation model produced via images taken by the NASA Shuttle Radar Topography Mission (SRTM).[37] Two computational approaches will be applied (models based on cost surfaces and electric circuit theory respectively) to two different scenarios: 1) a baseline scenario which only accounts the landscape topography (in terms of terrain slope); 2) a scenario where the Euphrates River constitutes a further physical and political barrier (see Veenhof 2008a, 18; Barjamovic

[37] The SRTM 90m DEM's have a resolution of 90m and can be downloaded from the following URL: http://www.cgiar-csi.org/data/srtm-90m-digital-elevation-database-v4-1

2008 and 2011). In this latter case, I assigned very high friction values to the raster cell corresponding with the Euphrates River so that to make it impossible to traverse it. Then, I created four different passages along this barrier on the basis of the location of the Euphrates' crossings proposed by Barjamovic (2011, 217-219).

In both scenarios I modelled past human movement between Aššur and Kaneš via three steps. First, I generated two cumulative cost surfaces from the digital elevation model (DEM) by using the r.walk algorithm in GRASS GIS: one starting from Aššur and the other one starting from Kaneš. This allowed me to create least-cost paths and least-cost corridors starting from both cities in order to reconstruct the communication routes crossed during the Old Assyrian Colony Period (Figs. 186 and 187). Second, I applied electric circuit theory to predict, by the flow of current over a friction surface (modelled by using the formula 1 above described), possible multiple pathways (Figs. 188 and 189). A third step consisted of applying electric circuit theory within least-cost corridors slices. This hybridizes least-cost corridor and circuit theory approaches and identifies areas important for connectivity, the so-called pinch-points (Figs. 190 and 191). These are portions of the landscape where movement is funnelled through narrow areas.

In the first scenario, a first look at the predicted least-cost paths and corridors shows that the easiest route between Aššur and Kaneš, in terms of energy expenditure, is the one crossing Cilicia and the Amuq valley (Fig. 186). Instead, electric circuit-based approach predicts multiple pathways to the south and the north of the Jebel Abd al-Aziz and the Jebel Sinjar that reach Anatolia not only via the Amuq valley and Cilicia (Fig. 188). The hybrid model (electric circuit and cost surface-based approach) outputs Cilicia as an important pinch-point funnelling the movement from Aššur to Kaneš (Fig. 190). A first look at the predicted routes and the pinch-points offer a picture which seems to differ with what most researchers have understood from studying the written sources: Cilicia and the Amuq valley may have been left outside the Old Assyrian Trade and belonged to another competing trade system, which excluded the Assyrian presence (see Barjamovic 2008, 91; Forlanini 2008; Veenhof 2008a; Barjamovic 2011a, 9). Hence, in the light of the absence of any Cilician toponym from the Assyrian written sources, the results of this first scenario make us reject the hypothesis stating that the topography of Upper Mesopotamia, in terms of terrain slope, alone affected the movement of Old Assyrian caravans. This is quite unsurprising considering the flat gently undulating plains of the Syrian/Iraqi Jazira.

The outputs of the second scenario provide, instead, a different picture. The least-cost paths and corridors proceed to the south of the Khabur Triangle and cross the Euphrates at a point consistent with the known crossing located at Samsat Höyük (Hahhum; see Fig. 187). Unlike scenario 1, no corridors and paths reach Kaneš via Cilicia. The density current map, instead, shows all possible multiple routes between Aššur and Kaneš and high connectivity values appear for the routes to the south and north of the Jebel Abd al-Aziz and the Jebel Sinjar, the four crossings along the Euphrates and Cilicia (Fig. 189). The pinch-points have been localised in correspondence of the four crossings of the Euphrates between Bireçik and the area ca. 150 km upstream, where the Euphrates Gorge begins (see Fig. 191). These results show how the Euphrates could have strongly shaped the journey of Assyrians caravans heading towards the commercial settlements in Anatolia. In particular, the route reaching Anatolia via the Euphrates' crossing in the area of Hahhum, is the easiest one in terms of energy expenditure. This may suggest that Hahhum, as the most accessible pinch-point and critical linkage between Upper Mesopotamia and central Anatolia, did indeed play a pivotal role as market town and stop on the route to Anatolia (Old Assyrian texts mention an inn in this town; see Barjamovic 2011a, 36, 87-92).

6.5.1 Discussion

The advantage of building a simple model based on the topography (in terms of terrain slope) of the area under investigation has allowed me to test if the landscape could have affected the movement of Old Assyrian merchants travelling from Aššur to Anatolia. The results show that the Assyrian traders perhaps did not cross the easiest pathway to reach Anatolia. In fact, past human movement across Upper Mesopotamia could have been affected by different factors such as the availability of water, the need to feed donkeys, the presence of political and physical barriers. As consequence, a little more complex model, calibrated with what known from the Old Assyrian textual evidence (see Barjamovic 2008 and 2011; Forlanini 2008; Veenhof 2008a), has been designed and has showed that the Euphrates River could have significantly affected the journey of the Old Assyrian caravans. In this new configuration, the most accessible crossings along the Euphrates is near Samsat Höyük (perhaps the ancient Hahhum) and at Birecik. This would match with the Old Assyrian routes proposed by Beitzel (1992) and Forlanini (2006). Hence, the high accessibility in those areas may explain the crucial role played by Hahhum (seat of a kārum) in the Assyrian trade system as pinch-point between Upper Mesopotamia and central Anatolia. After the Euphrates' crossing, the movement could have been funnelled into the few mountain passes and the inter-mountain valleys of the Taurus chain. In fact, a visual inspection of the least-cost corridors map shows that the Old Assyrian commercial settlements fall within the areas requiring the least energy expenditure to be traversed. Instead, it seems that within the northern Syrian and Iraqi Jazira a journey could have been less constrained by topography and physical barriers and more dispersed over two main axes: one to the south of the Jebel Abd al-Aziz and the Jebel Sinjar (see Goetze 1953 and Beitzel 1992), and one crossing the Khabur Triangle (see Forlanini 2006 and Kolinski 2014), where there was an Assyrian kārum at Apum (perhaps Tell Muhammed Diyab) during Kültepe's lower town level II (ca. 1970-1835 BC) and at Šubat-Enlil/Šeḫnā during Kültepe's lower town level Ib (ca. 1835-17th c. BC; see Eidem 2008). To conclude, the Euphrates River could have strongly affected the routes of the Assyrian caravans from Aššur that had the first part of their journey more dispersed within northern Jazira, and a second part of the journey, after crossing the Euphrates, more constrained by the topography of the landscape (see Barjamovic 2011a, 87, 101).

6.6 Colonies and Connectivity in the Assyrian Commercial Landscape

In this section, I will first investigate if the spatial distribution of the Old Assyrian commercial colonies (kārus and wabartus) is spatially correlated with geographical features such as natural corridors and mountain passes, based on the assumption that larger sites (the "network hubs") sprang up in places that not only had good access to primary resources (water, agricultural potential, raw materials, landscape defensibility) but that were also located at important joints along main natural routes, and in virtue of their strategic position could have played an important role in the Assyrian trade system. Second, on the basis of the Old Assyrian trade network's structure proposed by Barjamovic (2011a) and Forlanini (2008)[38], I will aim to answer two specific research questions:

- What were the likely routes crossed by the Assyrian caravans?
- To what extent can topography and the structure of the Old Assyrian trade system explain the prominence of specific colonies relative to others?

6.6.1 Proximity to geographical features

Having generated an omnidirectional connectivity map (see Fig. 192), it is then possible to calculate the distance of each commercial settlement from those areas showing the higher current density values (the upper 10% quantile). A good null hypothesis is that the mean of the colonies' distance from natural corridors is statistically indistinguishable from the mean of a random population's distance from natural corridors. We can perform a Monte Carlo simulation (Robert and Casella 2004) using 99 samples of 36 random locations (i.e. as many as the observed data) as representatives of the background population and one sample of the observed 36 archaeological sites (potentially providing a test at the 0.01 confidence level). If we rank these runs in ascending order, the mean distance from natural corridors of the observed sites and the mean distance from natural corridors in each of the 99 random samples, the former is the lowest one. This tells us that we have only a 1% chance of falsely stating that the Old Assyrian colonies were located in proximity of the main natural corridors of movement. The same kind of analysis, described above, has been performed also for the mountain passes (Fig. 193). Also in this case the *p-value* is equal to 0.01. In the light of these results, it seems that the Assyrians located their commercial settlements in those Anatolian cities close to the main natural routes and the mountain passes, two geographical features whose strategic control could guarantee the political and commercial prominence of a given city-state.

6.6.2 Connectivity

A method to assess which routes were mostly frequented on the basis of the topography and of the Old Assyrian trade system's structure is generating cumulative

[38] See paragraph 3.3.3 for a discussion about the structure of the Old Assyrian trade (fig).

pathways. This method will allow me to calculate the number of least-cost paths overlapping in a given cell. Hence, if two paths overlap, the value of the corresponding cell will be 2; if three paths overlap the resulting value will be three, and so on (for an example see Fig. 194). The results show that for both the earlier (1970-1835 BC) and later (1835-17th c. BC) periods the easiest and more frequented route to cross could have been the one from Hahhum to Hurama via Timelkiya (see Figs. 195-198). This is confirmed by the itineraries depicting a physical movement of Assyrian traders between these three cities (see Barjamovic 2011a, 93-94; 166-167; 181-182). In central Anatolia other three optimal routes stretched during the earlier period (ca. 1970-1835 BC): 1) one route from Kaneš to Purušhaddum via Wašhaniya and Ninašša; 2) a pathway from Kaneš to Durhumit via Amkuva; 3) a route from Hurama to Durhumit via Kuburnat. It is especially interesting that the latter route, from Hurama to Durhumit, roughly matches textual evidence for an alternative track ("narrow track") sometimes used by the Assyrian traders to smuggle shipment of goods from Aššur to northern Anatolia by avoiding Kaneš (Barjamovic 2011a, 169-180; Barjamovic 2011b, 162; see Fig. 152). This makes me speculate that the Assyrian merchants could have used the smuggler's track for two reasons: 1) guaranteeing the least energy expenditure for their pack donkeys due to the lack of inns and roads along this route; 2) following the easternmost possible route in order to avoid the usual taxation of Kaneš on trade.

6.6.3. Centrality

In this section I will assess the prominence of each commercial colony in the Old Assyrian network by calculating the current flow betweenness centrality (CFBC). This measure is a variant of betweenness centrality, in that it measures "to what extent a node contributes to paths or flows between all other nodes"(see Borgatti and Everett 2006; Newman 2010). More precisely, current-flow betweenness centrality (CFBC) assesses the go-between of a node within a network of links between all node pairs. This measure considers paths between all possible pairs of nodes in a given network, so that the loss of a node which is a go-between on a large proportion of the paths in the network would strongly affect connectivity between all nodes (Carrol *et al.* 2012). To calculate current flow betweenness centrality I used Centrality Mapper (McRae 2012; Available at: http://www.circuitscape.org/linkagemapper), which is part of the

Linkage Mapper Toolkit. Centrality Mapper calculates current flow centrality on the linkage network using Circuitscape (McRae and Shah 2009). Each Old Assyrian colony is treated as a node and to each edge is assigned a resistance equal to the cost-weighted distance of the corresponding least-cost corridor (LCC). Centrality Mapper, then, iterates through all colony pairs, injecting 1 Amp of current into one node and setting the other to ground. It adds up the results across all nodes and edges to generate a centrality score.

The results for Barjamovic and Forlanini's models during Kültepe's lower town level II period (ca. 1970-1835 BC) show that high centrality values for the colonies in Hahhum and Batna in the northern Jazira (Figs. 199 and 200). They are crucial hubs for keeping the network connected, because their loss would disconnect Upper Mesopotamia from Anatolia. In central Anatolia the highest value are recorded for Wašhaniya, Kaneš and Amkuwa (Figs. 199 and 200). They represent important intermediaries for connectivity towards the westernmost and the northernmost commercial settlements in the whole trade system. Particularly, the topography and the topology of the network may explain the main role played by Kaneš in the trade system set up by the Assyrians. There is no big difference between Barjamovic and Forlanini's models for this period. A big difference is represented by Purušhaddum's centrality score, which is higher in Forlanini's model as he identifies it with the archaeological site of Acemhöyük, which has a more central position in the Old Assyrian trade network. The centrality of colonies during Kültepe's lower town level Ib period (ca. 1835-17th c. BC) does not differ from the one of the earlier period (Fig. 201 and 202). Unsurprisingly, in this later period the centrality's values of nodes are lower as the network is composed of fewer colonies (20 vs. 36 of the earlier period) and consequently the flow of paths between nodes decreases. As in the earlier period, the only marked difference between Barjamovic and Forlanini's model is represented by Purušhaddum's centrality score. In addition, in both periods the kārus do not show higher centrality than wabartus. This suggests that the topography and the topological structure of the trade network cannot explain alone the hierarchy between the Assyrian colonies in the trade system. For instance, the prominence of two *kārus* such as Durhumit and Puruš733haddum can be explained by their respective function as a main market for copper and as an emporium for the trade of copper, textiles and wool (see Lassen 2010; Barjamovic 2011a, 241-242, 356-360).

6.6.4 Discussion

The results of this section reinforce the point that the Assyrians may have set up their colonies in those Anatolian cities close to geographical features such as natural corridors and mountain passes whose control could be vital for playing an active political and commercial role. In particular, the journey of the Assyrian caravans could have been more dispersed in Upper Mesopotamia until the Euphrates, and then more constrained by the physical barriers in Anatolia. The Euphrates Rivers could have played an important role as physical and political boundary between Upper Mesopotamia and Anatolia. For its location near to one of the Euphrates' main crossings, Hahhum may have been an important hub as market town and stop on the route to Anatolia. From this centre, could start one of the most frequented pathways leading to central Anatolia. In this area, an important road junction could have been played by Kaneš. From this city, two main optimal routes could have departed: 1) one east-west axe to Purušhaddum via Wašhaniya and Ninašša; 2) one south-north pathway to Durhumit via Amkuwa. In particular, it seems that the so-called smuggler's routes (from Hurama to Durhumit via Kuburnat) crossed by the Assyrian caravans for avoiding the fiscal control exerted by Kaneš, could have been the easternmost easiest possible pathway in the Old Assyrian trade network. Along these routes there were not Assyrian colonies and inns and the Assyrian smugglers could have opted for the easiest possible alternative route for their pack donkeys. From written sources, in fact, we know that the journey could be demanding for pack donkeys that could die during the travel from Aššur to Anatolia (see Stratford 2014). On the basis of the topography and the structure of the Old Assyrian trade network it is possible to detect sites that could have played an important role as intermediary of flow of goods across the connectivity system. In particular, Hahhum could have been a pinch point to inevitably cross and a linkage between two different cultural and geographical areas such as Upper Mesopotamia and Anatolia. The pivotal role of Kaneš in the Assyrian trade system could be explained as its position in the network, where results as the main intermediary between colonies in western, northern and south-eastern Anatolia.

6.7 Summary

This chapter first offered an overview of the theoretical aspects (e.g. definition of study area and scale of analysis) and methodological problems (social and environmental factors) that we need to take into account when interpreting past human movement. Four different computational approaches were chosen for answering the third research question of the present doctoral thesis: what were the patterns of past human movement and interaction on local and inter-regional scale. More particularly, what were the likely trade routes used by the donkey caravans starting from Aššur and heading to Anatolia and what they tell us about trading logistics and structure in the early second millennium BC. These four approaches were cost surfaces-based model, electric circuit theory, network analysis and spatial interaction modelling. They have been applied complementarily and the use of one does not exclude the use of another one as they are different tools in the same arsenal. Of course, the adoption of these methods is not straightforward due to the problems arising from the uncertainty in the archaeological data and in the difficulty in quantifying cultural and social factors that could have affected past human movement.

By combining our assessment of the above computational approaches we can provide a more detailed picture of past human dynamics of movement and interaction in Upper Mesopotamia and central Anatolia. A comparative perspective between a local and an inter-regional spatial scale of analysis can be summarised via the following points:

- At a local scale, both Central Anatolia and the Khabur Triangle can be characterised as politically fragmented landscapes, where movement is restricted (e.g. warfare, political instability) and most flow of people and goods occur between few large urban centres and their surrounding rural hinterlands. In central Anatolia, it is possible to detect two main areas of interaction: one within and one outside the Kızılırmak River's bend. On the other hand, the Khabur Triangle shows more different clusters of interaction and the hollow ways could be the direct evidence of the spatial flow of goods and people between settlements.

- At a larger inter-regional scale, the spatial interaction between Upper Mesopotamia and Anatolia could have been affected by physical and political barriers such as the Euphrates River, with Old Assyrian caravans departing from Aššur, heading to central Anatolia and crossing an important natural pinch-point on the Euphrates River near Hahhum. Movement across the northern Jazira seems to be more dispersed; while in central Anatolia could have been strongly affected by physical constraints (e.g. terrain slopes, mountains, etc.).

- The topographical and topological structure of the Old Assyrian Trade could explain the prominence of specific commercial colonies to others. In particular, it seems that the Assyrians located their colonies in those Anatolia city-states that could have exerted a control over strategic geographical features such as mountain passes and natural corridors of movements (e.g. alluvial intermountain valleys). The road system in Anatolia could have developed along two main axes of movement: an east-west route departing from Kaneš to Purušhaddum and a north-south pathway stretching from Hahhum to Durhumit via Kaneš.

The use of four different computational approaches has been applied, for the first time, to a case study. Often, archaeologists used just one or two of the techniques used in this chapter, by ignoring the fact that they should be applied complementarily in order to have a better explanation about dynamics of past human movement. The application of all of those methods has been extremely useful for identifying possible causal factors behind patterns of movement and interaction on local and inter-regional scale. Of course, the results showed above are to be considered just partial as they are mainly based on a simple topographical model calibrated, when possible, with the available archaeological, environmental and textual evidence for the early second millennium BC in the area under investigation. In fact, in this period both central Anatolia and Upper Mesopotamia were politically fragmented into several competing peer polities, and shifting political boundaries and alliances could have affected the journeys of the Assyrian caravans.

Chapter 7

Discussion: Landscapes of Interaction in Upper Mesopotamia and Anatolia

7.1 Introduction

Chapter 4 of the present thesis explored the spread of four specific examples of material culture (Syrian bottles, Khabur ware, balance pan weights and seals) that have plausibly been claimed to be associated with the activity of the Old Assyrian merchants. Chapter 5 was dedicated to the analysis of past settlement hierarchies in two well defined study areas: Khabur Triangle and central Anatolia. Chapter 6 offered an intra-regional and inter-regional spatial perspective and assessed the main axes of interactions and the most frequented corridors of movement via archaeological, textual and geographical evidence. Those three directions of enquiry have helped to answer the three research questions formulated in chapter 1. In particular, the first one, with its emphasis on the spatial distribution of specific kinds of seemingly "international" material culture confirmed overlapping circuits of commerce, and partial mappings of objects onto political landscapes of interaction in Upper Mesopotamia and central Anatolia. The second one offered empirical and statistical evidence for a political landscape rife with competition across both case studies (central Anatolia and the Khabur Triangle), with the growth of a few main urban centres occurring at the expenses of others. The third one's attention to the question of long-distance movement has suggested how the interplay of environmental and social factors could have affected the routing and intensity of passage of Old Assyrian caravans on both local and inter-regional scale. This chapter now seeks to re-examine these results and blend them into a more comprehensive overview of politics and commerce in the Old Assyrian period.

7.2 Defining political landscapes

Despite the advantages of the surviving archival data, defining the political landscapes in Upper Mesopotamia and central Anatolia remains a big challenge, especially in the light of the uncertainties present in the available archaeological and textual dataset. As I have already noted in the chapters 1 and 5, there are advantages in narrowing down, to the local scale of two well-defined case study areas such as the Khabur Triangle and central Anatolia, given the limited number of regions adequately surveyed in Upper Mesopotamia and Anatolia for the Middle Bronze Age (ca. 2000-1600 BC), and especially if we have an interest in how different geographical settings (an open tableland versus a mountainous inland area cut by large river valleys) contributed to the development of local settlement systems. In fact, in Upper Mesopotamia the general picture offered by archaeological survey looks patchy since investigations have mainly focused along the Euphrates River and its tributaries such as the Khabur and the Balikh (see Wilkinson 2000 for a broad overview about the archeological surveys carried out in Upper Mesopotamia). From this perspective, understanding the political landscapes occurring in the Khabur Triangle and central Anatolia in the early second millennium BC is crucial for defining where the activities of the Old Assyrian merchants took place. To the lack of a complete picture about settlement patterns from the archaeological survey record, we have to add further uncertainty of chronology and site size estimates for the Middle Bronze Age (ca. 2000 – 1600 BC) due the conservative characteristic of the early second millennium BC pottery assemblages used as chronological marker in central Anatolia and the Khabur Triangle (Schoop 2006 and 2009 for a discussion about central Anatolia; see Oguchi 2006 and Kolinski 2014 for the Khabur Triangle) and unwillingness or inability of existing archaeological surveys to offer period-specific size estimates (see examples for Tell Brak, Tell Beydar and Tell Hamoukar in the Khabur Triangle; Ur 2010b; Ur and Wilkinson 2008; Ur *et al.* 2007 and 2011).

Given these issues, the results of chapters 5 and 6 should be considered as offering only very broad explanations of the interplaying factors (social and environmental) that may have shaped the political landscapes of interaction in central Anatolia and Upper Mesopotamia in the early second millennium. The results for central Anatolia and the Khabur Triangle show that both regions were characterized by political landscapes fragmented into a system of city-states competing with one other for the control over natural resources, particular geographical features having a military strategic role (e.g. mountain passes, commanding views over landscape from the top of hills, fords, etc.), and grazing lands. The general picture offered is a network of politically independent but economically linked, socially interdependent and roughly equivalent polities, in which each one controlled a large rural hinterland via more or less obvious forms of centralised control. In particular, section 5.4 argued that, in the Khabur Triangle, there may have been a more heated competition and conflict between the city-states in comparison with central Anatolia. This could reflect the political situation in the Khabur Triangle, where the largest sites were packed in a smaller plain with a lack of marked topographical features (e.g. wide rivers, mountain ranges) that enhanced competition (e.g. perhaps captured by a higher fitted β parameter in our computational model) between large city-states of comparable size and political prominence (Eidem 2000, 257; Charpin and Ziegler 2003; Veenhof and Eidem 2008, 290-321; Ristvet 2008 and 2012; Palmisano *in press*). In addition, some urban centres could not be self-sustaining and relied more heavily on their rural hinterland to get agricultural products (small villages, farmsteads, hamlets, pastoral camp-sites). Tangible evidence of interactions between the main urban centres and secondary towns occurred via the hollow ways, which can be interpreted as the main vectors over which goods and people transited between settlements.

It also seems that the Khabur Triangle was less densely populated in the western part and more densely populated in its eastern part. This dual pattern has been explained by Ristvet and Weiss (2005 and 2010) as the result of lower rainfall to the west of the Wadi Jaghjagh and a more nucleated pattern of smaller overall settlements, perhaps with closely packed domestic quarters in the western Jazira (e.g. Chagar Bazar, Tell Mozan, and Tell Arbid). This explanation via rainfall is however questionable, as the only fairly slight differences in precipitation from east to west probably cannot explain so marked difference in settlement alone (see a recent study by J. Casana presented at the 9th ICAANE, 9th June 2014). Weiss and Ristvet's observation about domestic quarter packing could be more plausible but remains difficult to validate given the patchiness of the available archaeological data. Their argument about different population densities occurring in the western and eastern Khabur Triangle remains possible, but could also be the result of the different archaeological survey recovery methods applied to the two areas with no intensive surveys in the west except immediately around Tell Beydar (Ur and Wilkinson 2008; for extensive coverage, see Lyonnet 2000 and Meijer 1988), especially in light of the recent work by Colantoni (2012), which shows a heavily populated area around Tell Brak. On the other hand, this dual pattern remains a possibility, and if valid, could be explained with reference to the suggestions in the textual evidence of a rough coalition of kinglets (the Ida-Maraş confederacy), along and to the West of the Wadi Jaghjagh, predominantly sustaining themselves on pastoral or semi-pastoral economy, which would explain the more ephemeral archaeological evidence, and the territory near Šubat-Enlil/Šehna (Tell Leilan), which was mostly agricultural (see Joahnnes 1996, 344-345; Lyonnet 1996 and 1997; Wilkinson 2000 and 2002; Ristvet and Weiss 2013).

In central Anatolia, constraints of movement due to other factors such as political and territorial divisions could have made individuals travel shorter distances on average and to concentrate the flow of interactions among rural communities into few large local large urban centres (see Bachuber 2012, 576-578). This fits well with the central Anatolian political landscape suggested by the texts, which is fragmented into numerous independent city-states during the Old Assyrian Colony Period (ca. 1970-1700 BC; see Barjamovic 2011a, 6; Barjamovic *et al.* 2012, 44-49). It seems that Böğazköy could have naturally exerted a dominant influence within the bend of the Kızılırmak River, which could also have played as physical and political boundary. Other smaller sub-areas of interaction emerge around the other main urban centres to the south of the Kızılırmak River: Acemhöyük, Altilar Höyük, Kültepe; Sevket Tepesi; Varavan Höyük, and Yassihöyük (Ankara). Instead, across the basin between the Delice and the Kızılırmak Rivers, the settlement at Yassihöyük (Kirşehir) could have exerted its power. Unlike in the Khabur Triangle, in central Anatolia settlement systems appear more nucleated into large centres dominating their surrounding rural hinterlands and strong political and economic centralization is evident at Kültepe and Boğazköy.

Moving on now to a more diachronic perspective, during Middle Bronze Age I (ca. 2000-1800 BC), the political landscapes of these regions were divided into hundreds of city-states and tribal communities. The situation changed in the Middle Bronze Age II (ca. 1800 – 1600 BC), when large and centralized territorial states imposed their authority upon numerous and weaker existing political entities. In this period in northern Jazira we have Šamši-Adad I's kingdom (ca. 1808 – 1776 BC) and subsequently Zimri-Lim's kingdom (ca. 1780-1758 BC). To the west of the Euphrates River, in northwestern Syria there were the kingdoms of Yamkhad and Qatna (see Fig. 11). In the second half of the 18th century, Anitta was able to impose his power over the southern half of central Anatolia, and the texts show he took the title of Great King (Barjamovic *et al.* 2012, 50). Nevertheless, the city-states remained the more stable and longest-lasting political unit, while the larger regional kingdoms were often politically fragile and could last only one a generation or a single dynasty. Stepping back, the study of the available archaeological end textual evidence has revealed that the political landscapes of western Asia witnessed a series of repeated cycles from small political entities to large territorial states within a time span, which ranges from the fourth millennium to the first millennium BC (Marcus 1998; Thuesen 2000, 64; Ur 2010a). On a larger inter-regional scale, the Euphrates River could have played an important role as a political, fiscal and physical frontier (see Veenhof 2008a, 18; Barjamovic 2010, 84 ff.) and its crossing determined the passage to the west in Syria and to the north-west to Anatolia. In the early second millennium, it is important to point out that the acquisition of political power by the Amorite dynasties, members of the same ethnic group, had important implications. For the first time, rulers throughout Mesopotamia and Syria shared ties of kinship. Documents from Mari and Kaneš reveal that Mesopotamian and Syrian rulers were often in contact, sending envoys from court to court (Durand 1997-2000; Heimpel 2003) and the kings themselves traveled over long distances to visit each other (Villard 1986). Alliances were stipulated between Amorite kingdoms such as Yamkhad and Babylon, Ešnunna and Mari, only to be revoked shortly thereafter. Even dynastic marriages took place, as between Šamši-Adad I's son Yasmakh-Addu and the daughter of the king of Qatna (Podany 2010, 14). Although the Amorite rulers of Syria and Upper Mesopotamia may have shared kinship and ethnic identity, this did not prevent them in undertaking military hostilities against one another (Charpin and Ziegler 2003; Charpin 2004; Eidem 2011). Persistent and ubiquitous warfare were direct consequences of constant shifting alliances and competition for exerting the power over the surrounding territories and resources. This state of persistent warfare among neighboring city-states makes the whole political scenario extremely volatile.

In contrast to these textual details, the advantage of the computation and artefact-led picture offered in chapters 4, 5 and 6 is that it provides broad observations and some basic explanations about dynamics of interaction at both intra and interregional scales. The results provide a set of expectations for each of the two case studies investigated and offer a rough guide for interpreting the analysis of the empirical data both on local and inter-regional spatial scales. The key points can be summarized as follows:

- The political landscapes of Upper Mesopotamia and central Anatolia were fragmented into hundreds of city-states that on the one hand were cooperative and apparently motivated by maintaining good relations and avoiding conflict, but on the other hand were competitive and aiming to achieve political and logistic advantage.

- In the Middle Bronze Age II (ca. 1800 – 1600 BC) larger territorial states imposed their power over smaller and weaker communities. Nevertheless, they were particularly politically fragile and they lasted one generation or one dynasty.

- In central Anatolia settlement systems appear more nucleated in large urban centres dominating their surrounding rural hinterlands, and strong political and economic centralization is evident at Kültepe and Boğazköy. On the other hand, in the Khabur Triangle the patterns appear more dispersed and we have the superimposition of large urban centres on well (Tell Brak's area) or more loosely integrated (Tell Leilan's area) settlement systems of smaller sites (e.g. medium-small villages, farmsteads and camp-sites).

- Persistent warfare and political instability constrained the free movement of goods and people in both the Khabur Triangle and central Anatolia. In particular, the Khabur Triangle was animated by a more heated competition between the city-states in comparison with central Anatolia. This could be due to the lack of marked topographical features (e.g. wide rivers, mountain ranges), which could have further enhanced competition between large city-states of comparable size and political prominence packed in a smaller plain area.

- Movement across the northern Jazira seems to be more dispersed; while in central Anatolia could have been strongly affected by physical constraints (e.g. terrain slopes, mountains, etc.).

- The spatial interaction between Upper Mesopotamia and Anatolia could have been affected by the Euphrates River, which played as a political and natural frontier and encourage some very specific crossing points.

The work of the previous chapters has therefore been to provide a stronger empirical, quantitative and spatial explanation, which represents a new alternative fresh line of investigation to some processes otherwise previously analysed by scholars in descriptive and qualitative terms. The use of a variety of computational approaches has been extremely useful for identifying different dynamics of interaction, competition and conflict among the communities living in Upper Mesopotamia and in central Anatolia. In particular, investigating the conditions responsible for the growth of specific areas and/or urban centres and the decline of others, at different spatial scales, has provided a more complete understanding of the social processes involved. The picture that emerges from this study is that conflict and competition shaped the political landscapes occurring in central Anatolia and Upper Mesopotamia in the early second millennium BC, and it is in this context that the activities of the Assyrian traders emerged and took place.

7.3 Commercial landscapes of long-distance contacts

In the early second millennium the general picture is one of regional specialisation in production of goods, framed within a system of long-distance contacts bridging different geographic and cultural areas such as Mesopotamia and Anatolia. The system consisted of a series of interconnected and overlapping trading circuits interacting among themselves and built around a few centres specialising in commercial brokerage (see Larsen 1987, 53-54). From this perspective, particular types of material culture such as Syrian bottles, Khabur ware, pan balance weights and seals have plausibly been argued to be useful archaeological markers for long-distance contacts at different temporal and spatial scales. In chapter 4, these specific kinds of material culture have been analysed according to two distinct directions of research: 1) what can archaeological evidence tell us about the spatial distribution and structure of the different trade circuits occurring in the area? 2) To what extent the Old Assyrian trade network could have contributed to the spatial distribution of the above key object classes (Syrian bottles, Khabur Ware, balance weights and seals)? These are not impossible questions to answer, but they demand a more careful overall re-examination in the light of the results from the previous chapters.

A simple visual inspection of the spatial distribution of Syrian bottles in the early second millennium BC provides some first insights about the commercial landscapes occurring in my study area. Syrian bottles and their contents (fine oils and unguents) were probably originally manufactured in north-western Syria. It is noteworthy that they almost totally disappeared in central Anatolia and the Iraqi/ Syrian Jazira between the third and the second millennium BC (see Figs. 20 and 21). Unlike the Early Bronze Age, where Syrian bottles spread from the Aegean Sea to northern Mesopotamia, both as foreign imports and local imitation, in the early second millennium BC Syrian bottles are just confined to some sites in north/north-western Syria and in south-eastern Anatolia. Kültepe has yielded just one example of this kind of fine ware (lower town's level Ib, ca. 1835-17th c. BC) contemporary to the Old Assyrian commercial colony period. This striking difference with what is recorded for the earlier third millennium suggests that the Assyrians may have largely acted to exclude foreign merchants and certain goods (such as the bottles) from the trade system occurring in Upper

Mesopotamia and central Anatolia. This is also evidenced in a treaty signed between an Assyrian merchant and an Anatolian ruler, where there is a protectionist clause aiming to prevent competition from foreigner traders by their extradition for execution (Veenhof 2003b, 86-87; Barjamovic 2011a, 8). It is possible that the trade of this kind of fine ware could be related to a trade circuit related to the city-states such as Mari, Emar and Aleppo that may have held commercial control in the area to the west of the Euphrates (Aubet 2013, 288). The archaeological evidence, therefore, seems to confirm what is suggested by the written sources from Kültepe, where there is a total lack of Cilician toponyms for instance (Barjamovic 2008, 91). Cilicia and Syria could therefore have been located outside of the Old Assyrian trade network, and consequently most of the Assyrian caravan traffic towards Anatolia may have channelled into a northern route via the Euphrates' crossing near at Samsat Höyük (likely the ancient Hahhum).

Unlike Syrian bottles, the Khabur Ware spread over a larger area throughout Upper Mesopotamia and Anatolia. The available data allow us to delineate two main chronological stages and a diachronic east-west spatial distribution. It seems that Khabur Ware, in its early phase (*ca*. 2000 – 1800 BC), was mainly confined in the Khabur Triangle and the 'Afar plain, with just two sites yielding this ware falling outside of this main distribution zone. However, those two sites, Dinkha Tepe and Hasanlu, are an interesting case and their familiarity with these objects may be explained, to some extent, via the activities of merchants bringing tin from the rich deposits in the Kardagh Mountain of northeastern Iran and also from Afghanistan and Uzbekistan (Hamlin 1971, 135-136; Oguchi 1998, 91). In a letter from the reign of Šamši-Adad I, there is indeed reference to a tin depot in Šušarra (Tell Shemshara) in the Rania plain (Laessøe 1959, 85; Larsen 1967, 4; Larsen 1976, 87) and the sites of the Rania plain may be proposed as trading outposts through which tin from east reached Aššur.

In contrast, during its second phase (ca. 1800-1750/1730 BC), Khabur Ware spread over all the northern Iraq and Syrian Jazira and sporadically to the west of the Euphrates, in south-eastern Anatolia, in the Amuq valley and to Kültepe in central Anatolia. A visual inspection of Khabur Ware's frequency shows a gradient decrease as we move away from the Khabur Triangle and ʻAfar plain, the supposed areas of origin of this pottery (Fig. 43). It is very difficult to discern the causes that could have favoured the spread of this kind of pottery in this phase and multiple explanations might be proposed. The first aspect to point out is that the Khabur ware is mainly distributed within the Iraqi/Syrian Jazira and its frequency strongly decreases to the west of the Euphrates. This could suggest that the distribution of Khabur Ware could be the result of a shared cultural, political and economic Amorite landscape to the east of the Euphrates. The establishment of the politic borders of Šamši-Adad I's regional kingdom over an area stretching from Aššur in the east to Tuttul on the Balikh in the west could also have boosted and bounded the spread of this kind of pottery. On the other hand, the presence of a competing trade network in northwestern Syria and the presence of a political entity such as the kingdom of Yamkhad, could also have limited the spread of the Khabur Ware to the west of the Euphrates River. In particular, it seems that Khabur Ware, outside its presumed area of origins and production, occurs as occasional imports or personal items rather than being related to exchange and transport of specific fine regional products (in contrast to the case of the Syrian bottles). As consequence, its distribution in areas such as Lidar Höyük and at Imikuşaği might be interpreted as indirect presence of Old Assyrian traders along the routes crossing the upper Euphrates and leading to Kaneš via Malatya. Khabur Ware finds (6 small cups) in funerary contexts from Kültepe's lower town Ib may reflect household private possessions with symbolic meanings (e.g. as grave goods symbolizing the goods possessed by the deceased when in life; Oguchi 1997b, 208).

A complementary study of metrology and sealing offers a deeper opportunity to understand a variety of socio-cultural activities, including everyday local exchange or long-distance trade, legal transactions, ownership and authentication of goods, management and centralization of commodities. In particular, the spatial distribution of regional metrology systems and their overlap with other systems can provide us with clues about the coexistence and interaction of different polities and/or trade systems. Raw materials and goods from far-off areas (e.g. Indus Valley, Persian Gulf, Mesopotamia, Egypt, eastern Mediterranean, and Anatolia) moved across these circuits and polities with the aid of agreed conversions between weight systems and certain shared administrative practices and sealing techniques. Below I especially wish to stress the common characteristics of the seals and the balance pan weights, in terms of objects, practices and spatial distributions, as well as the implications of these. The data have shown that there is a spatial association between the materials with which the weights have been made and their distribution zones. Weights were mostly produced with local raw resources without excluding the employment of occasional materials coming from distant lands. The most common material used in seals and balance weights during the Middle Bronze Age is hematite. This material was used for almost all good quality seals in the first four centuries of the 2nd millennium throughout the whole Near East, but it was barely used in the earlier and later centuries (Collon 1990, 36), while for balance weights hematite had been in popular since the second half of the third millennium BC. This could suggest that the manufacture technology may have been transferred from the weights to the seals. A recent literature survey of geological deposits of known hematite sources that may have been exploited during the early 2nd millennium has revealed that this kind of iron oxide was available in all regions around Mesopotamia, from the west coast of Anatolia to eastern India, but the total absence of iron oxides in Upper Mesopotamia makes me speculate that hematite could have been introduced in the northern Jazira by the same trade activities that brought tin to Aššur from the east across the Iranian plateau and the Zagros Mountains.[39]

The adoption of different standard units of weight and glyptic styles over Upper Mesopotamia, Syria and central Anatolia suggests that weight systems and the seal styles are not only local to their respective areas of origin, but are the result of intense long-distance contacts among Mesopotamian, Syrian, Levantine and Anatolian communities. The overlap of different weight systems and glyptic styles over great distances shows the presence of different interlocking and intersecting commercial circuits. The spatial overlap between the different weight standard units and the glyptic style corroborates this view. In Anatolia, the seals belonging to the Old Assyrian and Old Syrian regional styles and the Babylonian weight system reflect the presence

[39] The Assyrians merchants were not directly involved in the import of tin to Assur. They perhaps left the provision of this good in other hands, and the city of Assur was just the terminal stage of a trade circuit to the east of the Zagros Mountains (Larsen 1987, 52).

of Old Assyrian merchants living in the commercial colonies (kārus and wabartus) distributed throughout Anatolia and the long-distance commercial and political contacts between Anatolian and Amorite kings as witnessed by the impressions of some seals found in the Sarıkaya Palace at Acemhöyük and belonging to Šamši-Adad I, to Dugedu (daughter of Yakhdun-Lim, king of Mari), to king Aplakhanda of Karkemiš, and to one of Yasmakh-Addu's correspondents (cf. Özguç 1980, 67; Özguç-Tunca 2001, 128). The higher contemporary frequency in Syria and northern Jazira of Old Babylonian and Old Syrian glyptic styles and Mesopotamian and Syrian weight systems could be explained as the consequence of tight political and trade contacts between the Amorite dynasties of Syria and Mesopotamia, which shared ties of kinship. The spatial distribution of the Anatolian glyptic style and weight system in central/southeastern Anatolia and in northwestern Syria almost perfectly match and exhibit a use that is mostly local (see Figs. 58 and 86). The contemporary absence of the Old Assyrian glyptic style to the west of the Middle Euphrates and the spread of the Syrian and Levantine standard weight units in northwestern Syria and Central Anatolia seem to show a marked different spatial distribution of two competing trade networks: a western one based on the axis between Anatolia and Syrian-Levantine region, and an eastern one based on the commercial system set up by the Assyrians.

Therefore, in the light of the available archaeological evidence, the following three interactions areas have been detected (Fig. 203):

- A western trade circuit to the west of the Middle Euphrates involving commercial exchanges between the Syrian and Babylonian polities and the Anatolian ones.

- An inter-regional trade system set up by the Assyrians over Upper Mesopotamia and central Anatolia.

- A cultural and ethnic Amorite *milieu* within northern Jazira favored by kings belonging to the same ethnic group and sharing ties of kinship. The establishment of Šamši Adad I and Zimri-Lim's regional kingdoms could have further favored this homogeneous cultural horizon.

Despite the above, it is worth emphasising again that these commercial interaction zones were fluid and not necessarily exclusive, being permeable to the movement of merchants and envoys belonging to other trade networks and political entities (see discussion in Barjamovic 2011a, 8-9). That aspect does not exclude attempts by states and other actors to monopolise certain trades and exclude competition (cf. Sever 1990, 261ff; Çeçer and Hecker 1995, 31-41; Veenhof 1995a; Barjamovic 2011a, 8). The Euphrates River could have played a crucial role as political/cultural and physical barrier constraining the free circulation of goods and merchants involved in long-distance trade exchanges. The Assyrian merchants' journey, as already showed in chapters 6, could have mainly used the route leading to Anatolia via ancient Hahhum (Samsat Höyük). Even though political relations and the establishment of territorial kingdoms could have encouraged trade, perhaps political landscapes alone are not to be considered the driving forces channelling commercial activities on larger interregional spatial scale. Diplomacy was important for avoiding violence, and for the stability of foreign exchange. For instance, the Assyrians were private entrepreneurs travelling and trading in foreign lands through an intense activity of diplomatic contacts and sworn agreements with the local Anatolian rulers (Barjamovic 2011a, 7). The Amorite kings of Syria and Mesopotamia corresponded with each other in a formal language and by exchanging gifts as result of political alliances (e.g. between Yamkhad and Mari, Mari and Ešnunna) and inter-dynastic marriages.

7.4 Bridging Upper Mesopotamia and Anatolia

The position of Aššur on the edge of dry lands and the absence of a productive rural hinterland could have stimulated its commercial vocation as crucial go-between transit point among different trade circuits of western Asia during the early second millennium BC. In this perspective, the trade network set up by the Assyrians should be considered just one among a variety of other commercial circuits operating in southern Mesopotamia, in Iran, in Syria, in the Levantine coast and in Anatolia.

Nonetheless, the Assyrian could also obtain advantages from the existence of such overlapping and interconnected trade circuits. For instance, the Assyrians were not directly involved in the import of tin from the east, which was brought to Aššur by foreign merchants (Barjamovic 2011a, 9). Textiles, another important good in the Assyrian trade network, were likely made in Lower Mesopotamia and brought to Assur by Babylonian merchants (Larsen 1976, 88-89; Larsen 1987, 51-52; Dercksen 2000, 138). [40] Therefore, it seems the Assyrians left the production and the supply of commodities destined for Anatolia in the hands of foreign merchants managing trade circuits to the east of the Zagros Mountains and in Lower Mesopotamia. The exemption from tax decreed by Erišum I could have encouraged a constant flow of goods to Aššur, which thereby became an important staging point and market for acquiring those goods (tin and textiles) that then were exported to Anatolia for higher profits. In this perspective, the trade system set up by the Assyrians must be seen as a single component within a bigger network of competing trade circuits.

Unfortunately, just four out of about forty commercial settlements of the Old Assyrian trade network have been identified with certainty. This renders problematic any kind of inference about the spatial structure of the network, but the more or less certain locations of toponyms proposed by several scholars (Barjamovic, Forlanini and Veenhof) represent a useful starting point for spatial approaches to the Old Assyrian commercial landscapes. The analyses in chapter 6 have showed the strategic location of the colonies, which were located in Anatolian towns with easy access to strategic geographical features such as the mountain passes and the natural corridors. Particularly in Anatolia, a landscape whose topography encouraged specific cultural/political boundaries and axis of movement, the political prominence of one urban centre to another could depend on control of narrow corridors of movement and roads. Particularly interesting it is the distribution of Assyrian commercial settlements along the main overland routes linking Upper Mesopotamia with central Anatolia on the upper Euphrates, especially between Bireçik and the area ca. 150 km upstream, where the locations of four crossings have been suggested by the analysis of textual evidence (Barjamovic 2011a, 217-218). The most frequented crossing was at

[40] Textiles were also produced by Assyrian women in a local industry.

Hahhum (Samsat Höyük), which was an important market town and a stop on the route to Anatolia. A secondary southern crossing could be between Batna and Uršu (around Gaziantep), which was the seat of a *kārum*.

As I have already noted above, it seems from the archaeological and textual evidence that Cilicia and northwestern Syria were off-limits areas for the activities of the Assyrian traders, with the Euphrates Rivers being the physical barrier between two distinct trade circuits: an eastern one managed by the Assyrians, and a western one involving Mari, Emar, Aleppo and Cilicia. Despite the fact that the Assyrians tried to root out competition from their trade with the Anatolian city-states, one letter referring the arrival of merchants from Ebla to an Anatolian town for acquiring copper, combined with the spread of Levantine and Syrian weight standard units, could reveal the existence of another commercial system active in central Anatolia and competing with the Assyrian one (see Barjamovic 2011a, 8). The Sarıkaya palace at Acemhöyük has yielded impressions of seals belonging to Šamši-Adad I, to Dugedu (daughter of Yakhdun-Lim, king of Mari), to king Aplakhanda of Karkemiš, and to one of Yasmakh-Addu's correspondents (Özguç 1980, 62). Therefore, beside the Old Assyrian trade network, which could have exerted almost a monopoly in the trade of specific goods such as wool, copper and tin, we should note the activity of merchants belonging to a trade system in which specific concessions could have been held by cities such as Aleppo, Emar, Karkemiš, Qaṭṭara, and Mari (Dalley *et al*. 1976; Tunca 1993; Veenhof 1993). A visual inspection of the spatial structure of the Old Assyrian trade network shows a cluster of commercial colonies distributed along the natural corridors in the valleys between the hills of the Anatolian plateau and in the plain of Konya to the north of the Taurus Mountains. This could be direct evidence of the involvement of the Assyrian traders in the local trade of copper and wool as supplement to their trade of imported tin and textiles from Aššur.

From this perspective, a reconsideration of the results from section 6.6, where the most frequented routes have been detected via a model based on the topography and the topological structure of the Old Assyrian trade network, can provide powerful insights into the connectivity of the *kārus* Durhumit and Purušhaddum, respectively important marketplaces for the purchase and sale of copper. In fact, the results show that the most frequented optimal routes (least energy expenditure according to terrain slope), tested on Barjamovic's model of the Assyrian trade network, seem to be along a north-south pathway from Hahhum to Durhumit and an east-west pathway from Hahhum to Purušhaddum via Kaneš and Wašhaniya. This could suggest that Purušhaddum and Durhumit, the two largest market places in Anatolia with Kaneš, despite being located in the periphery of the trade network, could have disposed of a connectivity system that facilitated the flow of merchants' caravans towards themselves. This result can also be considered in the light of the local trade of wool and copper managed by the Assyrians. In fact, wool could be procured from its main production centres in the east (Luhuzzatiya, perhaps to the north of the plain of Elbistan) and in the north (Tišmurna) around Durhumit and then exchanged for copper that was transported to Purušhaddum. In this city, the copper could be again exchanged for wool, which finally could be sold for silver, the main target of the Assyrian trade (Lassen 2010, 170-171). Therefore, it seems that the spatial distribution of the commercial settlements and their connectivity were related to the need to guarantee desired final outcomes for the trade circuit set up by the Assyrians.

On an inter-regional scale it is striking to see the role covered by Hahhum as linkage between two distinct geographic and cultural areas such as Mesopotamia and Anatolia. In this perspective, the major role played by Kaneš's kārum could be explained by its strategic location between the commercial colonies in northern Jazira and the ones in the central Anatolia plateau. In the case of Purušhaddum, its role can be framed into a wider spatial scale of analysis, as it can be considered as a gateway for commercial links between central Anatolia and the Mediterranean coast (Barjamovic 2008, 95). Of course, the importance of the commercial settlements cannot just be explained in terms of topography and topology within the trade system. In fact, the results from section 6.6 do not show a correlation between higher centrality values and commercial status of each colony (kārus vs. wabartus). The explanation are found in other reasons that could be the political role covered by the Anatolian city-states hosting the Assyrian commercial quarters, and/or the role of each trade centre as marketplace or production centre of those goods traded by the Assyrian on interregional (tin and textiles) and local (wool and copper) scale.

Another aspect to point out is the change of the Old Assyrian trade network in the later period contemporary to Kültepe's lower town level Ib (ca. 1835-17th c. BC). The picture drawn from the available written sources suggests a shrinkage of the whole trade network, where the number of commercial colonies halved. Of course, this is just a textual-biased picture and should be accepted just temporarily given the discrepancy of the available textual evidence from Kültepe's lower town level II (ca. 23,000 tablets) and level Ib (500 clay tablets).

Given the points stressed above, and taking into account the observed spatial properties of the Old Assyrian trade network, the following key features can be summarised:

- The Old Assyrian commercial system was a component within a larger global trade network of competing and interlocked trade circuits (Larsen 1987; Barjamovic 2008);

- The Assyrian merchants were involved in an interregional trade of tin and textiles that were perhaps brought to Aššur by foreign merchants and then exported by the Assyrian themselves to Anatolia for higher profits. This was made possible thanks to a careful logistic organization of the trade, characterized by a system of inns and stage points along the routes to Anatolia (Larsen 1987; Barjamovic 2011a).

- The spatial distribution of the Assyrian colonies in the central Anatolian plateau related to the guaranteeing of local trade in copper and wool, and its conversion into silver (Dercksen 1996). Important marketplaces such as Purušhaddum, Kaneš, and Durhumit may have benefited from a more formal road system developed along the most accessible and heavily used natural corridors (Barjamovic 2011a).

- Assyrian commercial quarters were set up in Anatolian towns that were topographically accessible and that could have disposed favourable economic conditions (e.g. proximity to mineral resources, production centres of given goods, etc.).

To sum up, the remarkable feature of the Old Assyrian trade was its ability to bridge two different cultural and geographical areas such as Upper Mesopotamia and Anatolia in a system of international and local interactions of concurrent interests between Anatolian communities and private Assyrian entrepreneurs.

Chapter 8

Conclusions

8.1 Final Remarks

This thesis took its point of departure from the convergence of three lines of enquiry. The first one took shape from the broad question of how human groups in this region interacted at different spatial scales during the Middle Bronze Age, and to what extent four types of material culture can shed new light to these inter-regional commercial landscapes of interaction. The second one arose from the specifics of the archaeological record and textual evidence of Middle Bronze Age settlements and had the aim of understanding the political landscapes present in Upper Mesopotamia and central Anatolia during the early second millennium BC. A third and final approach aimed to investigate how the Old Assyrian trade system was structured and operated within commercial and political contexts reconstructed via the first two lines of research. This interest in both local and the inter-regional scales of analysis has deeply shaped the structure of the thesis. Statistical analysis of patterns in the empirical record aimed to test whether known political and commercial landscapes occurring in my study area during the early second millennium BC could be confirmed. In addition, a process-oriented approach, seeking to determine the possible generative dynamics behind the observed patterns, has been adopted via the creation of a spatial interaction model and a series of different scenarios explored through this. Despite the existence of these apparently separate tracks of enquiry, the three lines of research were conducted simultaneously with continuous feedback between each other, culminating in the more blended discussion of the previous chapter.

The patchy characteristics of both archaeological and textual evidence do not offer an unequivocal picture of past politics and commercial landscapes, and I tried to integrate those two kinds of data sets in order to detect past misunderstandings and offer fresh lines of research. Although other authors pursued similar objectives, no attempts to assess Middle Bronze Age political and economic patterns in Upper Mesopotamia and Anatolia have been offered so far in a formal and unified fashion from an archaeological point of view. The few exceptions are, in fact, in most cases predominantly semi-quantitative descriptions focused on earlier (third millennium BC) or later periods (e.g. Late Bronze and Iron Ages). Furthermore, the past studies on the Old Assyrian trade system have been mainly text-based and there is a lack of syntheses of archaeological data that can be used to shed new light to long-distance trade contacts and inter-regional spheres of interaction.

This thesis has aimed to fill this gap by combining the broad research problem of the Middle Bronze Age political and economic landscapes occurring in Upper Mesopotamia and Anatolia with the more specific question of how the Old Assyrian trade system was structured and varied across space and time. This led to the formulation of three research questions: 1) what social processes can shape the commercial landscapes and the dynamics of spatial interaction between different communities pursuing rivaling or concurrent economic interests; 2) whether political dynamics of conflict and competition can be quantitatively observed; 3) determine the possible role played by the Old Assyrian trade network in shaping and/or exploiting the political and economic situation occurring at that time.

The first research question, concerning long-distance trade contacts, has been tackled by looking at the available published archaeological data of four particular examples of material culture (Syrian bottles, Khabur Ware, balance weights and seals). In chapter 4, they have been analysed in a quantitative and spatial perspective to discern commercial landscapes of interaction on both local and inter-regional scale. The spatial distribution of these classes of object has been analysed as a result of inter-regional contacts between communities sharing the same cultural milieu and political alliances and/or as evidence of trade circuits operating on local and inter-regional spatial scales. In this perspective, the results have showed the presence of different competing and concurrent trade systems operating in Mesopotamia, Syria and Anatolia. In particular, in northern Jazira and in north-western Syria there was an Amorite cultural milieu as expression of long-distance contacts between Lower Mesopotamian, Upper Mesopotamian and Syrian Amorite dynasties which shared kinship ties and signed political treaties and alliances. A trade circuit, perhaps managed by Syrian merchants, operated in north-western Syria and central Anatolia and rivalled with the trade system set up by the Assyrians, which spread across Upper Mesopotamia and central/south-eastern Anatolia. The results of the first research question warn, therefore, against the adoption of unquestioned assumptions with respect to shifts in political and commercial landscapes. The general picture appears much more fluid and concordantly the correlation between the political and economic situation does not imply necessarily the presence of a causal relationship. In fact, in the early second millennium BC the political landscapes were extremely volatile and required a huge diplomatic effort by merchants and political entities to operate on long-distance trade.

In chapter 5, the second research question has been tackled by analysing the settlement data from two specific case studies such as the Khabur Triangle and central Anatolia. The qualitative distinction between nucleated and dispersed pattern made necessary a formal redefinition. Nucleated patterns are characterized by the presence of few large urban centres and many smaller settlements; while dispersed pattern by a more homogenous distribution of sizes. It was argued that rank-size analysis offers the best framework, with nucleated patterns being comparable to primate distributions, and dispersed patterns to convex distributions. This formalisation also offered the opportunity to use a continuous measure (the A-coefficient,) for describing different settlement forms, enabling a switch from an arbitrary dichotomy to a full spectrum of variation, with the Zipfian distribution acting as a middle-point. In addition, a spatial interaction model has been applied to detect the possible general factors (e.g. ideology, population pressures, political and territorial divisions, topographical boundaries, etc.) and generative dynamics behind settlement hierarchies and the prominence and/or shrinkage of specific sites. This includes how political and geographic constraints affect regional settlement transformations, while also accounting for uncertainty in the archaeological data. The application of these two methods and other statistical measures of the settlement pattern required some methodological developments for overcoming the limits imposed by the intrinsic spatial and temporal uncertainty of the archaeological record. The use of bootstrap statistics technique tackled the problem of temporal and spatial uncertainty. This allowed me to compare generated possible spatial sequences of settlement pattern that might have occurred on the basis of the current state of archaeological knowledge with the empirical data. The results offered a formal and statistical account of the changes of settlement pattern according to the spatial scale of analysis (local vs. regional) and under which circumstances some sites became more prominent than others. However, it also made clear how the two case studies differed in their patterns. The most relevant difference between the two regions occur in the settlement size distribution at a smaller local scale, where settlement patterns appear nucleated in central Anatolia and more dispersed in the Khabur Triangle, which seems to have a more heated competition and conflict between the city-states. Moreover, the results of those two areas shed new light about dynamics of conflict and competition occurring in the fragmented political landscapes of western Asia in the early second millennium BC.

The conclusions from previous chapters suggested that the third question, that is to determine the possible role played by the Old Assyrian trade system within the political and commercial frame occurring at that time, should be addressed in two steps. First, hypotheses about the effects of landscape topography have been translated into simple models of movement and spatial interaction in chapter 6. They explored how and whether the landscape could have affected the long-distance routes and past human movement across Upper Mesopotamia and central Anatolia. Then, a baseline topographical model, calibrated with known archaeological and textual evidence, has shown the possible Assyrian merchant caravans routes on local and inter-regional scales across Upper Mesopotamia and Anatolia. The results showed that not surprisingly the movement seems more constrained in central Anatolia and more dispersed in northern Jazira. Furthermore, the Euphrates River could have played a significant role as a physical and political/cultural barrier in the area. Second, we have tested what is the distribution of the Assyrian commercial colonies and their status were related to presence of strategic geographic features and to the topology of the trade network itself set up by the Assyrians. Expectations derived from the computational models have been compared with the Old Assyrian trade system's structure proposed by Barjamovic and Forlanini with in conjunction with the available archaeological data. Given the uncertainty in identifying ancient toponyms with actual archaeological sites and the biased nature of written sources mostly from Kültepe, the broad outcomes offered by the model did not allow a detailed evaluation of the role played by each Assyrian trade colony and has, instead, offered a general overview of the relationship between trade network topology and landscape topography.

8.2 Directions for Future Research

The present work has demonstrated the benefits of exploring a variety of different modelling approaches to help explain how geographical settings and other factors may have shaped settlement hierarchy and areas of interaction across Upper Mesopotamia and central Anatolia during the Old Assyrian Colony Period (ca. 1970-1700 BC). In particular, the advantage of spatial interaction models is that they enable researchers to account for missing empirical data and to reproduce patterns of settlement growth, stability or decline matching known historical and archaeological evidence (e.g. geographical location, ideology, political or religious importance, trade contacts, etc.). In practical terms, these models are also useful for forecasting general areas where larger or smaller sites are to be expected. The combination of least cost path and electric circuit-based models also provided powerful insights about past human movement dynamics at different spatial scales and emphasized multiple aggregate patterns of movement. On the other hand, problems arising while tackling the last research question have highlighted the limits of the research present here as well, thereby outlining some potential new lines of enquiry. For example, the comparisons between archaeological and textual data have highlighted the constraints currently imposed by temporal uncertainties and the geographic scantiness of data for the first two centuries of the early second millennium (ca. 2000-1800 BC). Apart from the case of Kültepe's lower town, which has yielded a well-defined chronological sequence, most sites have offered only a coarser temporal resolution. Therefore, a diachronic development of political and trade landscapes occurring in the early second millennium BC cannot be offered in a detailed scale, but just broadly treating the

Middle Bronze Age time span as a whole. Furthermore, my consideration of known site size uses estimated extent while it may be more prudent to draw values from a weighted distribution. Further use of bootstrap techniques would be a useful way of overcoming some of these problems, although some will remain without further primary fieldwork.

A future stage of this research should therefore be the creation of models capable of generating more explicit and testable hypotheses at a larger spatial scale than the two case studies considered so far. This might involve more detailed spatio-temporal data, a precise definition of the initial conditions of the spatial models built, and the integration of extra archaeological settlement data and various classes of material culture. It would also be enlightening, in accordance with the research line already traced in Larsen's work (1987), to widen the area of modeling to encompass the trade networks from Iran to the western coast of Anatolia and from the Levantine coast until the Egyptian Nile delta. This would involve collecting archaeological settlement data from other areas such as Levant, Middle Euphrates, Lower Mesopotamia, eastern and Western Anatolia and then applying a slightly coarser spatial interaction model across this full region in order to detect dynamics of settlement growth and areas of interaction at a larger scale. A second useful way forward would be to conduct an intensive literature review of mineral deposits of tin, copper, silver and gold in order to map the mineral deposits that could have been used in the early second millennium.

In terms of artefact-scale work, collecting evidence for the spatial distribution of metallurgical objects (e.g. crucibles, ingots, moulds, etc.) could provide new clues and lines of enquiries about the international trade in mineral resources across all western Asia. Likewise, it would certainly be worth collecting wider evidence of balance weights and seals from all of western Asia, as well as paying greater attention to the composition of those iron oxide stone artefacts (e.g. via XRF) to explore their provenance. Additional classes of material culture that might provide insight into the character of long-distance relations in this period include weapons, personal ornaments vessel shapes, and clay tablets[41], all collected at a sufficiently large geographic scale so that they might offer more complete understanding of the commercial network as a whole and its interlocking trade circuits occurring during the Middle Bronze Age from the Iranian highlands in the east to the Aegean Sea and the Levantine coast in the west. Recently, a current project directed

Finally, the analysis of the empirical data presented in this thesis has already shown how the adoption of quantitative and statistical methods can bring broad benefits to the archaeology on Ancient Near Eastern and beyond. The use of spatial interaction models and other statistical techniques have provided useful solutions to some of the uncertainty in archaeological datasets and useful insights into observed archaeological patterns. Such a blend of well-defined quantitative and computational methods and archaeological-historical data (e.g. material culture, settlements data, and written sources) is, I would argue, a novel contribution to the field of Middle East archaeology and a useful way to approach the study of early complex societies worldwide.

[41] A recent work in progress by Stratford is aminig to trace the provenance of Old Assyrian clay tablets and bullae by making use of pXRF analysis.

Bibliography

Abay, E., 2011. Preliminary report on the survey project of Çivril, Baklan and Çal plains in the Upper Meander Basin, southwest Anatolia. *Ancient Near Eastern Studies 48*, 1-87.

Abu al-Soof, B., 1970. Mounds in the Rania Plain and Excavations at Basmusian. *Sumer 26,* 65-104.

Adams, R., McC, 1960. Early Civilization, Subsistence, and Environment. In: Kraeling, C. H., and Adams, R., McC (eds.), *A Symposium on Urbanization and Cultural Development in the Ancient Near East.* Chicago: University of Chicago Press, 269-95.

Adams, R., McC, 1965. *Land behind Baghdad: A History of Settlement on the Diyala Plains*. Chicago: University of Chicago Press.

Adams, R., McC, 1966. *The Evolution of Urban Society.* New York: Aldine.

Adams, R., McC, 1981. *Heartland of Cities: Surveys of Ancient Settlement and Land Use on the Central Floodplain of the Euphrates.* Chicago: University of Chicago Press.

Adriaensen, F., Chardon J. P., De Blust, G., Swinnen, E., Villalba, S., Gulinck, H. and Matthysen, E., 2003. The application of ''leastcost'' modeling as a functional landscape model. *Landscape Urban lan. 64*, 233–247.

Agha. A. A., 1987-88. "al-Ussiyeh" (in Arabic). *Sumer 45*, 110-141.

Algaze, G., 1989. A New Frontier: First Results of the Tigris-Euphrates Archaeological Reconnaissance Project, 1988. *Journal of Near Eastern Studies 48 (4),* 241-281.

Algaze, G., 1990. *Town and Country in Southeastern Anatolia. Vol. II: The Stratigraphic Sequence at Kurban Hoyuk*. Chicago: The Oriental Institute of the University of Chicago.

Algaze, G., 1993. *The Uruk World System: The Dynamics of Expansion of Early Mesopotamian Civilization.* Chicago: Chicago University Press.

Algaze, G., Breuninger, R., Lightfoot, C., and Rosenberg, M., 1991. The Tigris-Euphrates Archaeological Reconnaissance Project: A preliminary report of the 1989–1990 seasons. *Anatolica 17*, 175–240.

Algaze, G., Mısır, A., Wilkinson, T., Carter, E. and Gorny, R., 1992. Sanlıurfa Museum/University of California excavations and surveys at Titrish Hoyuk, 1991: A preliminary report. *Anatolica* 18, 33-51.

Algaze, G., Breuninger, R. And Knudstad, J., 1994. The Tigris-Euphrates Archaeological Reconnaissance Project: final report of the Birecik and Carchemish Dam survey areas. *Anatolica 20,* 1-80.

Alkım, U. B. and Alkim, H., 1966. Excavations at Gedikli(Karahüyük). First Preliminary Report. *Belleten 30*, 27-57.

Alkım, U. B., 1969. The Amanus Region in Turkey: New Light on the Historical Geography and Archaeology. *Archaeology 22*, 280-89.

Allen, M., 1992. The Mechanisms of Underdevelopment. An Ancient Mesopotamian Example. *Review 153*, 453-476

Alp, S., 1968. Zylinder und Stempelsiegel aus Karahöyük bei Konya. *TTKY V/26.*

Altaweel, M., 2005. The use of ASTER satellite imagery in archaeological contexts. *Archaeological Prospection 12(3)*, 151-166.

Altaweel, M., 2008a. *The imperial landscape of Ashur: settlement and land use in the Assyrian heartland.* Heidelberg: Heidelberg Orientverlag.

Altaweel, M., 2008b. Investigating agricultural sustainability and strategies in northern Mesopotamia: results produced using a socio-ecological modeling approach. *Journal of Archaeological Science 35,* 821-835.

Altaweel, M., 2013. The Application of an Entropy Maximising Model to the Rise of Urbanism. In: T. J. Wilkinson, M. Gibson, and M. Widell (eds.), *Models of Mesopotamian Landscapes.* Bar International Series 2552. Oxford: Archaeopress.

Altaweel, M., 2014. Settlement Dynamics and Hierarchy from Agent Decision-Making: a Method Derived from Entropy Maximization. *Journal of Archaeological Method and Theory.* DOI 10.1007/s10816-014-9219-6.

Altaweel, M., Palmisano, A., and Muhl, in press. In the land of the highlanders: From the kingdom of Simurrum to Mazamua in the Shahrizor. In: J. MacGinnis, D. Wicke, and A. Stone (eds.). *The Provincial Archaeology of the Assyrian Empire*. McDonald Institute Monographs.

Al-Maqdissi, M., Matoian, V. and Nicolle, C., 2007. *Céramique de l'Âge du Bronze en Syrie, II.* Beyrouth: Institut Français du Proche-Orient.

Amiet, P., 1992. *Sceaux-cylindres en hématite et pierres diverses*. Paris: Editions Recherche sur les Civilisations.

el-Amin, M. and Mallowan, M. E. L., 1950. Soundings in the Makhmur Plain. *Sumer 6,* 55-90.

Amiran, R., 1969. *Ancient Pottery of the Holy Land. From its Beginnings in the Neolithic Period to the End of the Iron Age.* Jerusalem: Massada Press Ltd.

Ammermann, A. J., 1985. Plow-Zone Experiments in Calabria, Italy. *Journal of Field Archaeology 12*, 33-40.

Andrae, W., 1922. Die Archaischen Ischtar-Tempel in Assur. *Wissenschaftliche Veröffentlichung der Deutschen Orient-Gesellschaft 39.*

Archi, A., 1984. Anatolia in the Second Millennium B.C. In: A. Archi (ed.), *Circulation of Goods in Non-Palatial Context in the Ancient Near East.* Roma: Edizioni dell'Atene, 31-123.

Archi, A., 1991. Culture de l'olivier et production de l'huile à Ebla. In: D. Charpin and F. Joannès (eds.), *Marchands, Diplomates et Empereurs. Etudes sur la Civilisation Mésopotamienne Offertes à Paul Garelli.* Paris: Editions recherché sur les civilisations, 211–222.

Arık, R. O. 1937. *Les fouilles d'Alaca Höyük entreprises par la Société d'Histoire Turque. Rapport préliminaire sur les travaux en 1935*. Ankara: Société d'Histoire Turque.

Arnaud, D., 1967. Contribution a l'etude de la metrologie syrienne au Iie millenaire. *Revue d'Assyriologie et d'Archeologie Orientale 4,* 151-169.

Arnold, D. E., 1985. *Ceramic theory and cultural process.* Cambridge: Cambridge University Press.

Ascalone, E., and Peyronel, L., 1999. Typological and Quantitative Approach to the Ancient Weight Systems. Susa, Persian Gulf and Indus Valley from the End of the III Mill. To the Beginning of the II Mill. BC. *Altorientalische Forschungen 26*, 352-377.

Ascalone, E., and Peyronel, L., 2000. "... secondo la norma del peso del re". Alalakh e Mari: contesti archeologici palatini e sistemi ponderali in Siria durante la media età del Bronzo. *Quaderni Ticinesi di Numismatica e Antichità Classiche 29*, 7-45.

Ascalone, E., and Peyronel, L., 2001. Two Weights from Temple N at Tell Mardikh-Ebla, Syria. A Link between Metrology and Cultic Activities in the Second Millennium BC? *Journal of Cuneiform Studies 53,* 1-12.

Ascalone, E., and Peyronel, L., 2003. Meccanismi di scambio commercial e metrologia pre-monetaria in Asia Media, Valle dell'Indo e Golfo Persico durante l'eta' del Bronzo. Spunti per una riflesione sulle sfere di interazione culturale. *Contributi e Materiali d' Archeologia Orientale 9*, 339-438.

Ascalone, E., and Peyronel, L., 2006a. Balance weights from Tell Mardikh-Ebla and the weighing systems in the Levant during the Middle Bronze Age. In: Alberti, E., Ascalone, E., and Peyronel, L. (eds.), *Weights in Context. Bronze Age*

Weighing Systems of Eastern Mediterranean: Chronology, Typology, Material and Archaeological Contexts. Proceedings of the International Colloquium Rome 22nd-24th November 2004. Roma: Istituto Italiano di Numismatica, 127-159.

Ascalone, E., and Peyronel, L., 2006b. *I pesi da bilancia dell'Eta' del Bronzo Antico e Medio. Materiali e Studi Archaeologici di Ebla*. Roma: Universita' degli Studi di Roma "La Sapienza".

Ascalone, E., and Peyronel, L., 2006c. Appendice B. Nota su due pesi da bilancia rinvenuti a Tell Tuqan. In: Baffi, F. (ed.), *Tell Tuqan. Ricerche archeologiche nella regione del Maath*. Galatina: Congedo Editore, 285-289.

Atici, L., 2014. Food and Ethnicity at Kültepe-Kanesh: Preliminary Zooarchaeological Evidence. In: L. Atici, F. Kulakoglu, G. Barjamovic, and A. Fairbairn (eds.), *Current Research at Kultepe/Kanesh: An Interdisciplinary and Integrative Approach to Trade Networks, Internationalism, and Identity (Journal of Cuneiform Studies Supplemental Series).* Atlanta: Lockwood Press, 195-211.

Aubet, M. E., 2013. *Commerce and Colonization in the Ancient Near East.* Cambridge: Cambridge University Press.

Auerbach, F. 1913. Das Gesetz der Bevolkerungskontration. *Petermanns Mitteilungen 1913,* 74.

Baccelli, G. And Manuelli, F., 2008. Middle Bronze Khabur Ware from Tell Barri/Kahat. In: Cordoba, J. M., Molist, M., Perez, M. C., Rubio, I. And Martinez, S. (eds.), *Proceedings of the 5th International Congress on the Archaeology of the Ancient Near East*, Madrid, 3-8 April 2008, vol. I, 187-205. Madrid: UAM Ediciones.

Bachelot, L., 1992. Una tombe construite du deuxieme millenaire avant J.C. a Mohammed Diyab. In: Durand, J. M. (ed.), *Recherches en Haute Mésopotamie : Tell Mohammed Diyab : campagnes 1990 et 1991. Memoire de Nabu 2*. Sepoa: Paris, 31-38.

Bachuber, C., 2012. Sumer, Ebla, Akkad and Anatolia. In: H. Crawford (ed.) *The Sumerian World*.London: Routledge, 498-516.

Bahar, H., 1998. Hatip-Kurunta anti ve çevresi yüzey arastirmalari 1996. *Arastırma Sonuçları Toplantısı* 15(2), 105-120.

Bahar, H., 2002. 2000 Konya ve Karaman illeri yüzey arastirmalari. *Arastırma Sonuçları Toplantısı 19* (2), 257-269.

Baird, D. 1996. Konya plain survey. *Anatolian Archaeology* 2: 12.

Baird, D. 1997. Konya plain survey. *Anatolian Archaeology* 3: 12-13.

Baird, D. 1998. Konya plain survey. *Anatolian Archaeology* 4: 16.

Baird, D. 1999. Konya plain survey. *Anatolian Archaeology* 5: 13-14.

Baird, D. 2000. Konya plain survey. *Anatolian Archaeology* 6: 15.

Baird, D. 2001. Konya plain survey. *Anatolian Archaeology* 7: 16.

Baird, D. 2002. Konya plain survey. *Anatolian Archaeology* 8: 19.

Ball, W., 2003. *Ancient settlement in the Zammar Region: excavations by the British Archaeological Expedition to Iraq in the Saddam Dam Salvage Project, 1985-86*. BAR International Series 1096. Oxford: Archaeopress.

Ball, W., 2007. *Excavations at Tell Abu Dhahir: excavations by the British Archaeological Expedition to Iraq in the Saddam Dam Salvage Project, 1985-86.* BAR International Series 1724. Oxford: Archaeopress.

Ball, W., Tucker, D., Wilkinson, T.J., 1989. The Tell al-Hawa Project: Archaeological Investigations in the North Jazira 1986-87. *Iraq 51,* pp. 1-66.

Balkan, K., 1955. *Observations on the Chronological Problems of the Karum Kani*š (TTKY VII/28). Ankara.

Balkan, K., 1957. Letter of King Anum-Hirbi of Mama to King Warshama of Kanish. *Türk Tarih Kurummu Yayinlarindan VII seri,* no. 31a.

Banning, E. B., 1996. Highlands and lowlands: Problems and survey frameworks for rural archaeology in the Near East. *Bulletin of the American Schools of Oriental Research 301,* 25-45.

Banning, E.B., 2002. *Archaeological survey*. Manuals in Archaeological Method, Theory, and Technique. New York: Kluwer Academic/Plenum Publishers.

Bär, J., 2005. Die Beziehungen zwischen Mari und Assur während der shakkanakku-Periode. In: van Soldt, W. H. (ed.), *Ethnicity in Ancient Mesopotamia*. Leiden.

Barjamovic, G., 2008. The Geography of Trade. Assyrian Colonies in Anatolia c.1975-1725 BC and the Study of Early Interregional Networks of Exchange. In: Dercksen, J. G. (ed.), *Anatolia and the Jazira during the Old Assyrian Period.* Leiden: Nederlands Instituut Voor Het Nabije Oosten, 87-100.

Barjamovic, G., 2011a. *A Historical Geography of Anatolia in the Old Assyrian Colony Period.* Copenhagen: Carsten Niebuhr Institute Publications.

Barjamovic, G., 2011b. A Journey Through Anatolia in 1865 BC. In: F. Kulakoğlu and S. Kangal (eds.), *Anatolia's Prologue, Kültepe Kanesh Karum, Assyrians in Istanbul*. Kayseri: Kayseri Büyüksehir Belediyesi, 160-168.

Barjamovic, G., 2013. Mesopotamian Empires. In: Bang, P. F., and Scheidel, W., (eds.), The Oxford Handbook of the State in the Ancient Near East and Mediterranean. Oxford: Oxford University Press: 120-160.

Barjamovic, G., Hertel, T., and Larsen, M. G., 2012. *Ups and Down at Kanesh. Chronology, Histori and Society in the Old Assyrian Period.* Leiden: Nederlands Instituut Voor Het Nabije Oosten.

Barjamovic, G., 2014. The Size of Kanesh and the demography of early Middle Bronze Age Anatolia. In: L. Atici, F. Kulakoglu, G. Barjamovic, and A. Fairbairn (eds.),

Current Research at Kultepe/Kanesh: An Interdisciplinary and Integrative Approach to Trade Networks, Internationalism, and Identity (Journal of Cuneiform Studies Supplemental Series). Atlanta: Lockwood Press, 55-67.

Barnes, J. A. and Harary, F., 1983. Graph theory in network analysis. *Social networks* 5, 235-244.

Bartl, K. and al-Maqdissi, M., Ancient Settlements in the Middle Orontes Region Between ar-Rastan and Qal´at Shayzar. First Results of Archaeological Surface Investigations 2003-2004. In: D. Morandi Bonacossi (ed.), *Settlement and Environment at Tell Mishrifeh/Qatna and in Central-Western Syria. Proceedings of the International Conference held in Udine, 9-11 December 2004, Studi Archeologici su Qatna 1*, 227-236, Udine 2007. Udine: Forum.

Bar-Matthews, Miryam, Ayalon, A., Kaufman, A., and Wasserburg, G., 1999. The Eastern Mediterranean Paleoclimatic as a Reflection of Regional Events: Soreq Cave, Israel. *Earth and Planetary Science Letters 166*, 85-95.

Batty, M., 2005. *Cities and Complexity: Understanding Cities with Cellular Automata, Agent-Based Models, and Fractals*. Cambridge: MIT Press.

Batty, M., Wilson, A. G., Hay, A., 1991. Classics in Human Geography Revisited: A Statistical Theory of Spatial Distribution Models. *Progress in Human Geography: an international review of geographical work in the social sciences and humanities 15, 433-436.*

Beardah, C. 1999. Uses of multivariate kernel density estimates. In L. Dingwall, S. Exon, V. Gaffney, & S. Laflin (Eds.), Archaeology in the Age of the Internet. Oxford: BAR International Series 750.

Beaujard, P., 2011. Evolutions and Temporal Delimitations of Bronze Age World-Systems in Western Asia and the Mediterranean. In: T. C. Wilkinson, S. Sherratt and J. Bennet (eds.), *Interweaving worlds.* Oxford: Oxbow, 7-26.

Begemann, F., S. Schmitt-Strecker, and E. Pernicka, 1992. The Metal Finds from Thermi III-V: A Chemical and Lead-Isotope Study, *Studia Troica* 2:219-39.

Begemann, F., S. Schmitt-Strecker, and E. Pernicka, 1995. Thermi on Lesbos: A Case Study of Changing Trade Patterns, *Oxford Journal of Archaeology* 14:123-36

Beitzel, B. J., 1992. The Old Assyrian caravan road in the Mari royal archives. In: Young, G. D. (ed.), *Mari in Retrospect: Fifty Years of Mari and Mari Studies.* Winona Lake: Eisenbrauns.

Belinski, P., 2000. Tell Arbid: Interim report of the fifth season. *Polish archaeology in the Mediterranean 12,* 315–326.

Belinski, P., 2002. Tell Arbid: The seventh season of excavations: Preliminary report.

Polish archaeology in the Mediterranean 14, 301–314.

Belinski, P., 2004. Tell Arbid: The ninth season of Syrian-Polish excavations. Preliminary report. *Polish archaeology in the Mediterranean 16*, 475-489.

Bell, T. and Lock, G., 2000. Topographic and cultural influences on walking the ridgeway in later prehistoric times. In Lock, G. (ed.), *Beyond the Map: Archaeology and Spatial Technologies*, 85–100. Amsterdam: IOS Press.

Bell, T., Wilson, W. and Wickham, A., 2002. Tracking the Samnites: Landscape and communications routes in the Sango Valley, Italy. *American Journal of Archaeology* 106, 169-186.

Bender, B., 1993. *Landscape: Politics and Perspectives.* Oxford: Berg.

Bennet, J., 1988. Approaches to the Problem of Combining Linear B Textual Data and Archaeological Data in the Late Bronze Age Egean. In: French, E. B., and Wardle, K. A. (eds.), *Problems in Greek Prehistory.* Bristol: Bristol Classical Press, 509-518.

Bernardini, W., 2007. Jeddito yellow ware and Hopi social networks. *Kiva 72*(3), 295–328.

Bevan, A., 2007. *Stone Vessels and Values in the Bronze Age Mediterranean.* Cambridge: Cambridge University Press.

Bevan, A., 2010. Political Geography and Palatial Crete. *Journal of Mediterranean Archaeology 23.1*, 27-54.

Bevan, A., 2011. Computational models for understanding movement and territory. In: V. Mayoral Herrera and S. Celestino Pérez (Eds.), *Tecnologías de Información Geográfica y Análisis Arqueológico del Territorio: Actas del V Simposio Internacional de Arqueología de Mérida*. Mérida: Consejo Superior de Investigaciones Científicas, 383-394

Bevan, A. 2012. Spatial methods for analysing large-scale artefact inventories. *Antiquity 86(332)*, 492-506.

Bevan, A., 2013. Travel and interaction in the Greek and Roman world. A review of some computational modeling approaches. In: S. Dunn and S. Mahony (eds.), *The Digital Classicist*. Exeter: Short Runn Press Limited, 3-24.

Bevan, A., and Conolly, J., 2006. Multiscalar approaches to settlement pattern analysis. In Lock, G. and Molyneaux, B. (Eds.), *Confronting Scale in Archaeology: issues of theory and practice*. New York: Springer, 217-234.

Bevan, A., and Conolly, J., 2013. *Mediterranean Islands, Fragile Comunnities and Persistent Landscapes. Antikythera in Long-Term Perspective.* Cambridge: Cambridge University Press.

Bevan, A., and Wilson, A. G., 2013. Models of spatial hierarchy based on partial evidence. *Journal of Archaeological Science 40,* 2415-2427.

Bevan, A., Frederick, C., and Krahtopoulou, N., 2003. A digital Mediterranean countryside: GIS approaches to the spatial structure of the post-Medieval landscape on Kythera, Greece. *Archeologia e Calcolatori* 14,217-36.

Bevan, A., Crema, E., Li, X, and Palmisano, A., 2013. In: Bevan, A. and Lake, M. (eds.), *Computational Approaches to Archaeological Spaces*. Walnut Creek, California: Left Coast Press, 27-52.

Beyer, D., 1984. Le Sceau de Kabi-Addu, fils d'Asqudum. *M.A.R.I. Annales de Recherches Interdisciplinaires 3*, 255-256.

Beyer, D., 2001*. Emar IV. Le sceaux*. Fribourg : Editions universitaires Fribourg

Beyer, D., 2008. Les empreintes de Sceaux-Cylindres. In: Tunca, O., and Baghdo, A. M. (eds.), *Chagar Bazar (Syrie) III*. Paris: Peeters, 129-137.

Bilgi, Ö. 2001. *Protohistoric age metallurgists of the central Black Sea region : a new perspective on the question of the Indo-Europeans' original homeland*. Istanbul: TASK Vakfı.

Binford, L., 1977. General Introduction. In: L. Binford (ed.), *For Theory Building in Archaeology.* New York: Academic Press, 1–13.

Birkin, M., and Heppenstall, A., 2011. Extending Spatial Interaction Models with Agents for Understanding Relationships in a Dynamic Retail Market. *Urban Studies Research Volume 2011 (2011),* Article ID 403969, 12 pages.

Birot, M., 1985. Les chroniques "assyriennes" de Mari. *MARI 4.*

Bittel, K., Naumann, R., Beran, T., Hachmann, and Kurt, G., 1957. *Boğazköy III : Funde aus den Grabungen 1952-1955*. Berlin: Verlag Gebr. Mann.

Blanton, R. E., 1976. The role of symbiosis in adaptation and sociocultural change. In: E.R. Wolf (Ed.), *The Valley of Mexico: Studies in Prehispanic Ecology and Society*. Albuquerque: University of New Mexico Press, 181–201.

Boehmer, R. M., 1972. *Die Kleinfunde von Boåzköy*. Berlin: Verlag Gebr. Mann.

Boehmer, R. M., 1979. *Die Kleinfunde aus der Unterstadt von Boğazköy.* Berlin: Verlag Gebr. Mann.

Boehmer R. M., and Guterbock, H. G., 1987. *Glyptik aus dem Stadtgebeit von Bogazkoy*. Berlin: Gebr. Mann Verlag.

Boese, J., 2008. "Harbašipak", "Tiptaki" und die Chronologie der älteren Kassiteinzeit. *ZA 98,* 201-210.

Bonechi, M., 1992. Relations Amicales Syro-Palestiniennes: Mari et Hasor au XVIIIe siècle av. J-C. In: Durand, J. M. (ed.), *Florilegium Marianum: Recueil d'Etudes en l'Honneur de Michel Fleury*. Paris: Nouvelles Assyriologiques Brèves et Utilitaires, 9-22.

Bong, W.S.K., K. Matsumura, K. Yokoyama, and I. Nakai. 2010. Provenance study of early and middle bronze age pottery from Kaman-Kalehöyük, Turkey, by heavy mineral analysis and geochemical analysis of individual hornblende grains, *Journal of Archaeological Science* 37:2165-78.

Borgatti, S. P. and Everett, M. G., 2006. A graph-theoretic perspective on centrality. *Social Networks 28,* 466–484.

Bottema, S. and Woldring, H., 1990. Anthropogenic indicators in the pollen record of the Eastern Mediterranean. In: Bottema, S. , Entjes-Nieborg, G. and van Zeist, G. , (eds.), *Man's role in the shaping of the eastern Mediterranean landscape*. Rotterdam: Balkema , 231–265.

Boyer, P., Roberts, N., and Baird, D., 2006. Holocene environment and settlement on the Çarsamba alluvial fan, south-central Turkey: Integrating geoarchaeology and archaeological field survey. *Geoarchaeology 21 (7),* 675 - 98.

Braidwood, R.J. 1937: *Mounds in the plain of Antioch: an archeological survey*. Oriental Institute Publications, 48. Chicago.

Branting, S., Wilkinson, T. J., Christiansen, J., Widell, M., Hritz, C., Ur, J., Studevent-Hickman, B., and Altaweel, M., 2013. The "External Economy": Networks and Trade. In: T. J. Wilkinson, M. Gibson, and M. Widell (eds.), *Models of Mesopotamian Landscapes.* Bar International Series 2552. Oxford: Archaeopress.

Brantingham, P. J., Surovell, T. A. and Waguespack, N. M., 2007. Modeling postdepositional mixing of archaeological deposits. *Journal of Anthropological Archaeology 26*, 517–540.

Braudel, F. 1995. *The Mediterranean and the Mediterranean World in the Age of Phillip II*. London: University of California Press.

Broodbank, C., 2000. *AnIsland Archaeology of the Early Cyclades.* Cambridge: Cambridge University Press.

Broodbank, C., 2013. *The Making of the Middle Sea. A History of the Mediterranean from the Beginning to the Emergence of the Classical World.* London: Thames & Hudson.

Brown, G. H., 1967. Prehistoric Pottery from the Antitaurus. *Anatolian Studies 17,* 123-164.

Brughmans, T., 2013. Thinking Through Networks: A Review of Formal Network Methods in Archaeology. *Journal of Archaeology Method and Theory 20*, 623–662.

Brumfiel, E. M., 1987. Elite and utilitarian crafts in the Aztec State. In: Brumfiel, E.M, and Earle T.K, (eds.), *Specialization, Exchange, and Complex Societies*. New York: Cambridge University Press, 102–18.

Bryce, T., 2005. *The Kingdom of the Hitites.* Oxford: Oxford University Press.

Buccellati, G., and Kelly-Buccellati, M., 1983. Terqa: The First Eight Seasons. *Les Annales Archeologiques Arabes Syriennes 33*, 47-67.

Buccellati, G. and Kelly-Buccellati, M., 1988. *Mozan 1. The Soundings of the First Two Seasons.* Malibu: Undena Publications.

Buccellati, G. and Kelly-Buccellati, M., 1991. Mozan. In: Weiss, H., Archaeology in Syria. *American Journal Archaeology 95,* 712-714.

Budd, P., and Taylor, T., 1995. The Faerie Smith Meets the Bronze Industry: Magic Versus Science in the Interpretation of Prehistoric Metal-Making. *World Archaeology 27,* 133-143.

Budd, P., Pollard, A. M., Scaife, B. and Thomas, R.G., 1995. Oxhide ingots, recycling, and the Mediterranean metals trade. *Journal of Mediterranean Archaeology 8*, 1-32.

Buia, D., 1993. *Historical Implications Derived from Descriptive Study of the Excavated Structures and Ceramics of a Second Millennium B.C. Near Eastern Site, Ancient Terqa*. Phd unpublished thesis. Ann Arbor: UMI Dissertation Services, Bell & Howell Information and Learning, ProQuest Company.

Bulgarelli, 2011. Financial and economic activity in Mesopotamia. In: Barjamovic, G., Dahl, J. L., Koch, U. S., Sommerfeld, W. and Westenholz, J. G. (eds.), *Akkade is King. Acollection of papers by friends and colleagues presented to Aage Westenholz on the occasion of his 70th birthday 15th of May 2009.* Leiden: Nederlands Instituut Voor Nabije Oosten, 37-53.

Burke, P., 1986. City-States. In: Hall, J. A. (ed.), *States in History.* New York: Basil-Blackwell, 137-153.

Burney, C., 1956. *Northern Anatolia before Classical Times. Anatolian Studies,* 179-203.

Burney, C., 1977. *From village to Empire. An Introduction to Near Eastern Archaeology*. Oxford: Phaidon Press.

Carroll, C., McRae, B. H. and Brookes, A., 2012. Use of Linkage Mapping and Centrality Analysis Across Habitat Gradients to Conserve Connectivity of Gray Wolf Populations in Western North America. *Conservation Biology 26* (1), 78–87.

Carruba, O., 2003. *Anitta res gestae. Anitta, King of the Hittites.* Studia Mediterranea 13, Series Hethaea 1. Pavia: Italian University Press.

Carter, T., Poupeau, G., Bressy, C. and Pearce, N.J.G., 2006. A new programme of obsidian characterization at Çatalhöyük, Turkey'. *Journal of Archaeological Science 33(7)*, 893-909.

Carter, T., Dubernet, S., King, R., Le Bourdonnec, F.-X., Milić, M., Poupeau, G. and Shackley, M.S., 2008. Eastern Anatolian obsidians at Çatalhöyük and the reconfiguration of regional interaction in the Early Ceramic Neolithic. *Antiquity 82 (318)*, 900-909.

Casana, J., 2013. Radial route systems and agro-pastoral strategies in the Fertile Crescent: New discoveries from western Syria and southwestern Iran. *Journal of Anthropological Archaeology 32 (2),* 257, 273.

Casana, J., Cothren, J., and Kalayci, T., 2012. Swords into ploughshares: archaeological applications of CORONA satellite imagery in the Near East. *Internet Archaeology 32 (2).*

Casana, J., and Cothren J., 2013. The CORONA Atlas Project: Orthorectification of CORONA Satellite Imagery and Regional-Scale Archaeological Exploration in the Near East. In: D. Comer and M. Harrower (eds.), *Mapping Archaeological Landscapes from Space.* Springer, 33-43.

Castel, C., 1990. Découverte d'un sceau-cylindre paléo-assyrien : Mohammed Diyab, une étape pour les marchands assyriens en route vers la Cappadoce. In: Bachelot, L. , Castel, C., Charpin, D., Durand, J. M., Faivre, X., Lyionnet, B., and Sauvage, M. (eds.), *Tell Mohammed Diyab, Campagnes 1987 et 1988.Cahiers de NABU 1*. Paris: Sepoa, 51-58.

Çeçen, S., and Hecker, K., 1995. '*ina mātika eblum. Zu einem neun Text zum Wegerecht, in der Kültepe-Zeit", Festschrift für Wolfram Freiherrn von Soden zum 85. Geburstag am 19. Juni 1993*. Münster, 31-41.

Charlton, T. H., and Nichols, D., 1997. The City-State Concept. Development and Applications. In: Charlton, T. H., and Nichols, D. (eds.), *The Archaeology of City-States*. Washington: Smithsonian Institution Press, 1-14.

Charpin, D., 1987. Shubat Enlil et le pays d'Apum. *M.A.R.I. 5*, 129-141.

Charpin, D. and Ziegler, N., 2003. *Florilegium marianum. 5, Mari et le Proche-Orient à l'époque amorrite : essai d'histoire politique*. Paris: Société pour l'étude du Proche-Orient ancien.

Cherry, J. F., 1983. *Frogs Round the Pond: Perspectives on Current Archaeological Survey Projects in the Mediterranean Region.* In: Keller D. R. and Rupp D. W. (eds.), *Archaeological Survey in the Mediterranean Region.* Oxford: British Archaeological Reports, 375-416.

Christaller, W.,1933. *Die zentralen Orte in Süddeutschland. Eine ökonomisch-geographische Untersuchung über die Gesetzmäßigkeit der Verbreitung und Entwicklung der Siedlungen mit städtischen Funktionen*, Jena.

Ciafardoni, P., 1992. Insediamenti aramaici e pre-aramaici nella regione di Idlib. In. Mazzoni, S. (ed.), *Tell Afis e l'età del Ferro.* Pisa.

Claessen, H. J. M., and Skalník, P., 1978. The early state: Theories and hypotheses. In: Claessen, H. J. M., and Skalník, P. (eds.), *The early state*. The Hague:

Clark JE. 1995. Craft specialization as an archaeological category. *Research in Economic Anthropology* 16: 267–94.

Cleuziou, S., and Berthoud, T., 1982. Early Tin in the Near East: A Reassessment in the Light of New Evidence from Western Afghanistan. *Expedition 25* (1): 14-25.

Cohen, R., 1978. Introduction. In: Cohen, R., Service, E. R. (eds.), *Origins of the state: The anthropology of political evolution.* Philadelphia: Institute for the study of human issues.

Cole, S.W. and Gasche, H., 1998. Second- and first millennium BC rivers in northern Mesopotamia. In: Gasche, H., Tanret, M. (Eds.), *Changing Watercourses in Babylonia. Towards A Reconstruction of the Ancient Environment in Lower Mesopotamia.* Ghent: University of Ghent, 1–64.

Collar, A. C. F., 2007. Network theory and religious innovation. *Mediterranean Historical Review 22(1)*, 149–162.

Collar, A. C. F., 2008. *Networks and religious innovation in the Roman Empire*. Unpublished PhD thesis, University of Exeter.

Collischonn, W. and Pilar J.V., 2000. A direction dependent least-cost path algorithm for roads and canals. *International Journal of Geographical Information Science,* vol. 14, no. 4, 397-406.

Collon, D., 1975. *The seal impressions from Tell Atchana/Alalakh*. Kevelaer : Butzon & Bercker.

Collon, D., 1982. *The Alalakh Cylinders Seals.* Oxford: BAR International Series."

Collon, D., 1986. *Catalogue of the Western Asiatic Seals in the British Museum-Cylinder Seals III, Isin-Larsa and Old Babylonian Periods.*London : Trustees of the British Museum.

Collon, D., 1990. *Near Eastern seals.* London: British Museum Press.

Collon, D., 1997. *7000 years of seals.* London: British Museum Press.

Collon, D., 2005. *First Impressions: cylinder seals in the Ancient Near East.* London: British Museum Press.

Conolly, J., and Lake, M., 2006. *Geographical Information Systems in Archaeology.* Cambridge University Press.

Cosgrove, D. E., and Daniels, S., 1988. *The Iconography of Landscape: Essays on the Symbolic Representation, Design, and Use of Past Environments.* Cambridge: Cambridge University Press.

Costin, C. L., 1991. Specialization: Issues in Defining, Documenting, and Explaining the Organization of Production. In: Schiffer, M. (ed.), *Archaeological Method and Theory*, Volume 3. Tucson: University of Arizona Press, 1-56.

Courtois, J., 1973. Prospection archéologique dans la moyenne vallée de l'Oronte (El Ghab et Er Roudj: Syrie du nord-ouest). *Syria 50, 1/2,* 53-99.

Crema, E., Bevan, A., Lake, M. 2010. A probabilistic framework for assessing spatio-temporal point patterns in the archaeological record. *Journal of Archaeological Science* 37.5: 1118–1130.

Crema , E., 2013. Cycles of change in Jomon settlement: a case study from Eastern Tokyo Bay. *Antiquity 86*, 1169-1181.

Crema, E. R., 2014. A simulation model of fission-fusion dynamics and long-term settlement change. *Journal of Archaeological Method and Theory, 21*, 385-404.

Crone, P., 1986. The tribe and the state. In: Hall, J. A., (ed.), *States in History.* Oxford: Basil Blackwell, 48-77.

Crumley, C. L., 1976. Towards a locational definition of state systems of settlement. *American Anthropologist 78,* 59–73.

Crumley, C.L., 1995. Heterarchy and the analysis of complex societies. In: Ehrenreich, R.M., Crumley, C.L., and Levy, J.E., (eds.), *Heterarchy and the Analysis of Complex Societies*. Archaeological Papers of the AmericanAnthropological Association 6: 1-5. Arlington, Virginia: American Anthropological Association.

Cunliffe, B., 2003. Societies and Territories in Iron Age Wessex. In: Bourgeois I. and Bourgeois B. (eds.). *Bronze Age and Iron Age Communities in North-Western Europe*. Archaeologia Protohistorica 10 (Brussels 2003) 111–133.

Curtis, J., 1982. *Fifty years of Mesopotamian discovery: the work of the British School of Archaeology in Iraq 1932-1982.* London: British School of Archaeology in Iraq.

Curvers, H. H., 1988. Chapter 10: The Period VII Pottery. In: van Loon, M. N. (ed.), *Hammam et-Turkman I. Report on the University of Amsterdam's 1981-84 Excavations in Syria,* 397-455. Leiden: Publications of the Netherlands Historical and Archaeological Institute in Istanbul.

Curvers, H. H., Schwartz, G. M., and Dunham, S., 1997. Umm el-Marra, a Bronze Age Urban Center in the Jabbul Plain, Western Syria. *American Journal of Archaeology 101*, 201-239.

Czichon, R.M. 1997. Studien zur Regionalgeschichte von Hattuša/Boğazköy. *Mitteilungen der Deutschen Orient-Gesellschaft 129*, 89-102.

Czichon, R.M. 1998. Studien zur Regionalgeschichte von Hattuša/Boğazköy. *Mitteilungen der Deutschen Orient-Gesellschaft 130*, 81-90.

Czichon, R.M. 2000. Das Hattuša-Boğazköy Surveyprojekt (Karte). In P. Matthiae, A. Enea, L. Peyronel and F. Pinnock (eds.), *Proceedings of the First. International Congress of the Archaeology of the Ancient Near East. Rome, May 18th-23rd 1998.* Rome: La Sapienza, 269-277.

Czichon, R. M., and Werner, P., 1998. *Tall Munqaba - Ekalte I. Die bronzezeitlichen Kleinfunde. Ausgrabungen in Tall Munqaba*. Saarbrucken.

D'Agostino, A., 2012. Hirbemeron Tepe and the Upper Tigris Valley during the Early Second Millennium BC. In: Laneri, N., Pfälzner, P., and Valentini, S. (eds.), *Looking North.* Wiesbaden: Harrassowitz Verlag, 193-212.

Dalley, S., 2002. *Mari and Karana: two old Babylonian cities*. Piscataway, NJ: Gorgias Press.

Dalley, S., Walker, C.B.F., and Hawkins, J.D., 1976. *The Old Babylonian Tablets from Al-Rimah*. London: British School of Archaeology in Iraq.

Davies, T., Fry, H., Wilson, A. G., Palmisano, A., Altaweel, M., and Radner, K., 2014. Application of an entropy maximizing and dynamics model for understanding settlement structure: the Khabur Triangle in the Middle Bronze and Iron Ages. *Journal of Archaeological Science* 43, 141-154.

Day, P., C. Doumas, H. Erkanal, V. Kilikoglou, O. Kouka, M. Relaki, and V. Şahoğlu. 2008. New Light on the "Kastri group": a petrographic and chemical investigation of ceramics from Liman Tepe and Bakla Tepe. *Arkeometri Sonuçları Toplantısı* 24:335-46.

De Atley S. P. and Findley F. J., 1984. *Exploring the limits: frontiers and boundaries in prehistory. British Archaeological Reports International Series 223.*

Deckers, K., and Riehl, S., 2007. Fluvial Environmental Contexts for Archaeological Sites in the Upper Khabur Basin. *Quaternary Research 67*, 337-48.

Deckers, K., and Pessin, H., 2010. Vegetation development in the Middle Euphrates and Upper Jazira (Syria/Turkey) during the Bronze Age. *Quaternary Research 74,* 216-226.

Deimel, A., 1931. *Sumerische Tempelwirtschaft zur Zeit Urukuginas und seiner Vorgänger.* Rome.

Diakonoff, I. M., 1982. The Structure of Near Eastern Society Before the Middle of the 2nd Millennium BC. *Oikumene* 3:7-100.

Di Cosmo, N., 2000. Ancient City-States of the Tarim Basin. In: Hansen, M. H. (ed.), *A Comparative Study of Thirthy City-State Cultures.* Copenhagen: Special-Trykkeriet Viborg, 393-407.

Dercksen, J. G., 1996. *The Old Assyrian Copper trade in Anatolia.* Istanbul: Nederlands Historisch-Archaeologisch Instituut te Istanbul.

Dercksen, J. G., 2000. Institutional and private in the Old Assyrian period. In: A. C. V. M. Bongenaar (ed.), *Interdependency of Institutions and Private Entrepreneurs*. Leiden: Nederlands Hitorisch-Archaeologisch Intituut te Istanbul, 136-152.

Dercksen, J. G. 2001: '"When we met in Hattuš". Trade according to Old Assyrian Text from Alishar and Boğazköy' in H.W. van Soldt, J. G. Derckesen, N. J. C. Kouwenberg, T. J. H. Krispijn (eds.), *K. R. Veenhof Anniversary Volume*. Leiden: 39-66.

Dercksen, J. G., 2004a. *Old Assyrian Institutions.* Leiden: Nederlands Instituut voor het Nabije Oosten.

Dercksen, J. G., 2004b. Some elements of Old Anatolian society in Kanis.In: Dercksen, J. G., (ed.), *Assyria Beyond. Studies presented to Mogens Trolle Larsen.* Leiden: Nederlands Instituut vor het Nabije Oosten.

Dercksen, J. G., 2005. Metals according to Documents from Kültepe-Kanish dating to the Old Assyrian Colony Period. In: Yalshin, U. (ed.), *Anatolian Metal III.* Bochum: Der Anschnitt, 17-34.

Dercksen, J. G., 2011. The beginning of the Old Assyrian year. *NABU 2011 no.75*.

Dittmann, R., 1990. Ausgrabungen der Freien Universitat Berlin in Assur und Kār-Tukultī-Ninurta in den Jahraen 1986-89. *Mitteilungen der Deutschen Orient-Gesellschaft 122,* pp. 157-171.

Di Nocera, G. M., 2006. Il cambiamento del sistema insediativo come testimonianza di trasformazione socioeconomica: il caso delle comunità preistoriche dell'alto Eufrate tra V ed inizio del II millennio a.C. In: Cardarelli, A., *Le r a g i o n i d e l c a m b i a m e n t o. Nascita, "declino" e "crollo" delle società tra fine del IV e inizio del I millennio a.C..* Roma.

Di Nocera, G. M., 2008. Settlements, Population and Landscape on the Upper Euphrates between V and II millennium B.C. Results of the Archaeological Survey Project 2003-2005 in the Malatya Plain. In: J. M. Córdoba, M. Molist, M. C. Pérez, I. Rubio, and S. Martinze (eds.), *Prooceedings of the 5th International Congress on the Archaeology of the Ancient Near East*, 3-7 April 2006, Madrid. Madrid: UAM Ediciones.

Di Nocera, G. M., 2009. Il cambiamento del sistema insediativo come testimonianza di trasformazione socioeconomica: il caso delle comunità preistoriche dell'alto Eufrate tra V ed inizio del II millennio a.C. *Scienze dell'Antichità* 15, 143-155.

Dohmann, H. and Pfalzner, P., 2000. Ausgrabungen Der Deutschen Orient-Gesellschaft in Der Zentralen Oberstadt von Tall Mozan/Urkeš. *Mitteilungen Der Deutschen-Orient Gesellschaft Zu Berlin 132*, 185-228

Dönmez, S. 1999. Sinop-Samsun-Amasya illeri yuzey arastırması 1997. *Arastırma Sonuçları Toplantısı* 16(2): 513-36.

Dönmez, S. 2000. Sinop-Samsun-Amasya illeri yüzey ara$tırması 1998. *Arastırma Sonuçları Toplantısı* 17(2), 229-244.

Dönmez, S. 2002. The 2nd millennium B.C. settlements in Samsun and Amasya Provinces, central Black Sea region, Turkey. *Ancient East and West* 1(2), 243-293.

Doyle, P. G., and J. L. Snell. 1984. *Random walks and electrical networks*. Washington, DC: Mathematical Association of America.

Drennan, R., 2009. *Statistics for Archaeologists.* New York: Springer.

Drennan, R. D. and Peterson, C. E., 2004. Comparing archaeological settlement systems with rank-size graphs: a measure of shape and statistical confidence. *Journal of Archaeological Science 31,* 533–549.

Driel, G. van, 1994. Private or Not-So-Private: Nippur Ur III Files. In: Gasche H., Tanret M., Janssen C., Degraeve A. (eds.), *Cinquante-deux reflexions sur le Proche-Orient Ancien*, offert en hommage à Léon de Meyer. Leuven: MHEOP II, 181-192.

Driel, G. van, 1999-2000. "The Size of Institutional Umma." *AfO* 46/47:80-91.

Ducke, B., and Kroefges, P. C., 2008 From points to areas: constructing territories from archaeological site patterns using an enhanced Xtent model. In: A. Posluschny, K.Lambers and I. Herzog (eds.), *Layers of Perception: Proceedings of the 35th International Conference on Computer Applications and Quantitative Methods in Archaeology (CAA), Berlin, Germany, April 2–6, 2007*. Kolloquien zur Vor- und Frühgeschichte 10: 245-51.Dr. Rudolf Habelt GmbH: Bonn.

Durand, J. M., 1982. Relectures d'ARM VIII, I. Collations. *M.A.R.I. 1*, 91-135.

Durand, J. M., 1998. *Les documents épistolaires du palais de Mari*. Paris: Cerf.

Durand, J. M., 1997-2000. *Les documents épistolaires du palais de Mari.* Paris: Les Éditions du Cerf.

Durand, J. M., 2004. Peuplement et sociétés à l'époque amorrite les clans bensim'alites. In: Nicolle, C. (ed.), *Nomades et sedentaires dans le Proche-Orient ancien : compte rendu de la XLVIe Rencontre assyriologique internationale,* Paris, 10-13 juillet 2000. Paris: Éditions recherche sur les civilisations.

Duru, R., 2006. *Gedikli Karahöyük 1.* Ankara: Türk Tarih Kurumu.

Dyson, R. H., Jr., 1965. Problems of Protohistoric Iran as Seen from Hasanlu. *Journal of Near Eastern Studies 24,* 193-217.

Dyson, R. H., Jr., 1973. Chapter XVI. The Archaeological Evidence of the Second Millennium BC on the Persian Plateau. In: Edwards, I. E. S., Gadd, C. J. And Hammond, N. G. L (eds), *The Cambridge Ancient History*, vol. II part 1, 686-715.

Du Mesnil du Buisson, R. M. E. L., 1927. Les Ruines d'el-Mishrifé au nord-est de Homs (Emése). *Syria VIII*, 13-32.

Du Mesnil du Buisson, R. M. E. L., 1930. Compte rendu de la Quatrienne campagne de fouilles a Mishrifé-Qatna. *Syria XI*, 146-163.

Du Mesnil du Buisson, R. M. E. L., 1930b. Compte rendu de la Quatrienne campagne de fouilles a Mishrifé-Qatna. *Syria XI*, 146-163.

D'Agostino, A., 2012. Hirbemerdon Tepe and the Upper Tigris Valley during the Early Second Millennium BC: A First Assessment of the Local Pottery Horizon. In: N. Laneri, P. Pfalzner & S. Valentini (eds.), *Looking North: The Socioeconomic Dynamics of the Northern Mesopotamian and Anatolian Regions during the Late Third and Early Second Millennium BC.* Harrassowitz Verlag: Wiesbaden 2012, 51-80.

Edmonds, M., 1999. *Ancestral Geographies of the Neolithic: Landscapes, Monuments and Memory.* London: Routledge.

Efe, T., 2002. The Interaction Between Cultural/Political Entities and Metalworking in Western Anatolia during the Chalcolithic and Early Bronze Ages, in Yalçın (ed.), *Anatolian Metal II. Der Anschnitt*. Bochum, 49-65.

Efe, T. 2003. Pottery Distribution Within the Bronze Age of Western Anatolia and its Implications upon Cultural, Political (and Ethnic?) Entities, in Özbaşaran, Tanındı and Boratav (eds.), *Archaeological essays in honour of Homo amatus: Güven Arsebük için Armağan Yazıları*. Istanbul: Ege Yayınları, 87-104.

Egloff, B. J., 1972. The sepulchral pottery of Nuamata Island. *Archaeology and Physical Anthropology in Oceania 7*, 145-163.

Eichler, S., Haas, V., Steudler, V., Wäfler, M. and Warburton, D., 1985. *Tall al-Hamīdīya 1. Vorbericht 1984* (Orbis Biblicus et Orientalis, Series Archeologica 6). Freiburg: Universitätsverlag Freiburg Schweiz.

Eidem, J., 1991. An Old Assyrian Treaty from Tell Leilan. In: Charpin, D. and Joannès, F. (eds.), *Marchands, Diplomates et Empereurs. Etudes sur la civilization mésopotamienne offertes à Paul Garelli.* Paris: ERC, 185-207.

Eidem, J., 1992. *The Shemshara Archives 2: The Administrative Texts*. Copenhagen: Royal Danish Academy of Sciences and Letters.

Eidem, J., 2000. Northern Jazira in the 18th century BC. Aspects of geo-political patterns. In: O. Rouault and M. Wäfler (eds.), *La Djéziré et l'Euphrate syriens de la protohistoire à la fin du IIe millénaire av. J.-C.: tendances dans l'interprétation historique des données nouvelles*. Subartu, 7. Turnhout: Brepols, 255–64.

Eidem, J., 2008. The evidence from Tell Leilan. In: Dercksen, J. G. (ed.), *Anatolia and the Jazira during the Old Assyrian Period.* Leiden: Nederlands Instituut Voor Het Nabije Oosten, 31-41.

Eidem, J., 2010. *The Royal Archives from Tell Leilan. Old Babylonian Letters and Treaties from the Eastern Lower Town Palace.* New Haven and London: Yale University Press.

Eidem, J., and Laessøe, J., 2001.*The Shemshara Archives 1: The Letters* (Historisk-filosSkrifter 23). Copenhagen: Royal Danish Academy of Sciences and letters.

Eidem, J., and Warburton, D., 1996. In the Land of Nagar: A Survey around Tell Brak. *Iraq* 58, 51-64.

Einwag, B., 1993. Die Keramik dem Gruftbereich des jungen Palastes in Tall Bi'a. *Mitteilungen der Deutschen Orient-Gesellschaft 125,* 33-50.

Eisenstadt, S., 1993. *The political systems of empires*. New Brunswick: Transaction Publishers.

Emre, K., 1963. The Pottery of the Assyrian Colony Period According to the Building Levels of the Kaniş Karum. *Anatolia VII,* 87-99.

Emre, K., 1989. Pottery of levels III und IV at the karum of Kanesh. In: K. Emre, B. Hrouda, M. Mellink, and N. Özgüç (eds.), *Studies in Honor of Tahsin Özgüç.* Ankara: Türk Tarih Kurumu Basımevi, 111-128.

Emre, K., 1999. Syrian Bottles from the Karum of Kanish. In: Mikasa, P. T. (ed.), *Essays on Ancient Anatolia*. Wiesbaden: Harrassowitz Verlag, 39-50.

Engin, A., 2009. Sivas ili 2007 yılı yuzey arastırması. *Arastırma Sonuçları Toplantısı* 26(2), 73-94.

Eppihimer, M., 2013. Representing Ashur: The Old Assyrian Rulers' Seals and Their Ur III Prototype. *Journal of Near Eastern Studies 72*, 35-49.

Ericson, J., and GoLdstein, R., 1980. Work Space: a New Approach to the Analysis of Energy Expenditure within Site Catchments. In: F. FindLow and J. Ericson (eds.), *Catchment Analysis: Essays on Prehistoric Resource Space*. Los Angeles: University of California, 21–30.

Erkanel, H., 1988. Girnavaz. *Mitteilungen der Deutschen Orient-Gesellschaft 120,* 139-151.

Evans, J. P., and Smith, R. B., 2006. Watervapor transport and the production of precipitation in the Eastern Fertile Crescent. *Journal of Hidrometeorology 7*, 1295-1307.

Evans T. S. and Rivers R. J., 2012. Interactions in Space for Archaeological Models. *Advances in Complex Systems* 15.

Evans, T. S., Rivers, R. J., and Knappet, C., 2012. Interactions in space for archaeological models. *Advances in Complex Systems 15.*

Faivre 1992, X. La céramique de Mohammed Diyab, 1990-91. In: Durand, J. M. (ed.), *Tell Mohammed Diyab, Campagnes 1990 et 1991, Memoires de N.A.B.U. 2,* 55-89. Paris: Sepoa.

Faivre X. and Nicolle, C., 2007. La Jézireh au Bronze moyen et la céramique du Khabur. In: *Al-Maqdissi, M., Matoian, V. and Nicolle, C. (eds.), Céramique de l'Âge du Bronze en Syrie, II,* 179-229.

Falconer, S. E. and Savage, S. H., 1995. Heartlands and Hinterlands: Alternative Trajectories of Early Urbanization in Mesopotamia and the Southern Levant. *American Antiquity, 60,* 37–58.

Falsone, G., and Sconzo, P., 2008. *Tell Shiyukh Tahtani. Relazione sull'attività della Missione nell'anno 2008.* Retrieved on the web page: http://www.unipa.it/falsone/it/TST08.pdf

Falsone G., and Sconzo, P., 2010. *Tell Shiyukh Tahtani. Relazione della campagna di scavo 2010.* Retrieved on the web page: http://www.unipa.it/falsone/it/TST10_it.pdf

FAO (Food and Agriculture Organization of the United Nations), 1966. *Étude des resources en eaux souterraines de la Jazireh syrienne.* Room: Food and Agriculture Organization of the United Nations.

Feinman, G. M., and Nicholas, L.M., 2000. High intensity household-scale production in Ancient Mesoamerica: a perspective from Ejutla, Oaxaca. In: Feinman, G.M., and Manzanilla, L., (eds.), *Cultural Evolution: Contemporary Viewpoints*. New York: Kluwer, 119–44.

Feinman, G. M., and Garraty, C. P., 2010. *Annual Review of Anthropology 39,* 167-191.

Feldman, M., 2006. *Diplomacy by Design*. Chicago: The University of Chicago Press.

Fischer, F., 1963. *Die Hethitische Keramik von Boğazköy-Hattusa*. Berlin.

Finer, S. E., 1997. *The history of government from the earliest times, I: Ancient monarchies and empires.* Oxford: Oxford University Press.

Finley, M., 1999. *The Ancient Economy*. Berkeley: University of California Press.

Finzi, C. V., and Higgs, E. S., 1972. Prehistoric economy in the Mount Carmel area of Palestine:
Site catchment analysis. *Proceedings of the Prehistoric Society 36,* 1-37.

Flannery, K., 1972. The Cultural Evolution of Civilizations. *Annual Review of Ecology and Systematics 3*, 399–426.

Fleming, D.A. 2004. *Democracy's ancient ancestors: Mari and early collective governance.* Cambridge: Cambridge University Press.

Fontenari, S., Franceschetti, S., Sorrentino, D., Mussi, F., Pasolli, M., Napolitano, M., and
Flor, R., 2005. *r.walk*. GRASS GIS.

Forlanini, M., 2004. La nascita di un impero. Considerazioni sulla prima fase della storia hittita: da Kaniš a Hattuša. *Orientalia 73,* 363-389.

Forlanini, M., 2006. Étapes et itineraries entre Asˇsˇur et l'Anatolie des marchandes paléo-Assyriens: nouveaux documents et nouveaux problèmes. *Kaskal 3*, 147–175.

Forlanini, M., 2008. The Historical Geography of Anatolia and the Transistion from the Karum-Period to the Early Hittite Empire. In: Dercksen, J. G. (ed.), *Anatolia and the Jazira during the Old Assyrian Period.* Leiden: Nederlands Instituut Voor Het Nabije Oosten, 57-86.

Foster, B., 1977. Commercial Activity in Sargonic Mesopotamia. *Iraq 39*, 31-44.

Foster, B., 1981. A new look at the Sumerian temple state. *Journal of the Economic and Social History of the Orient 24:* 225-41.

Fox, C., 1923. *The Archaeology of the Cambridge Region.* Cambridge: Cambridge University Press.

Fox, Richard G., 1977. *Urban Anthropology: Cities in their Cultural Settings*. Englewood Cliffs, NJ: Prentice-Hall.

Fukai, S. and Matsutani, T., 1977. Excavations at Telul eth-Thalathat 1976. *Sumer 33,* 48-64.

Frahm, E., 2012. Distinguishing Nemrut Dağ and Bingöl A Obsidians: Geochemical and Landscape Differences and the Archaeological Implications. *Journal of Archaeological Science 39(5)*, 1435-1444.

Frahm, E., and, Feinberg, J., 2013. Environment and Collapse: Eastern Anatolian Obsidians at Urkesh (Tell Mozan, Syria) and the Third-Millennium Mesopotamian Urban Crisis. *Journal of Archaeological Science 40(4),* 1866-1878.

Frane, J. E., 1996. The Tell Leilan Period I Habur Ware Assemblage. Phd unpublished thesis. University of North Carolina.

Franken, H. J., 1978. Pottery from Middle Bronze Age Tomb. In: Moorey, R., and Parr, P. (eds.), *Archaeology in the Levant. Essays for Kathleen Kenyon*. Warminster: Aris e Phillips LTD, 67-75.

French, D., 1970. *Notes on Site Distribution in the Çumra Area. Anatolian Studies 20,* 139-148.

French, D. 1988. *Roman Roads & Milestones of Asia Minor. Fasc. 2: An Interim Catalogue of Milestones*, *BAR International Series: BIAA Monograph* 392/9/1. Oxford: BAR.

French, D., 1998. Pre- and early-Roman roads of Asia Minor: the Persian Royal road. *Iran* 36, 15-43.

Fried, M. H., 1967. *The Evolution of Political Society: An Essay in Political Anthropology.* New York: Random House.

Friedman, J., Gills, B.K., and Modelski, G. (Eds.), *World System History*. London: Routledge, 201-215.

Fugmann, E., 1958. *Hama. Fouilles et recherches 1931-1938. L'architecture des periods pre-hellenistiques.* Copenhageb: Nationalmuseet.

Fuji, H., 1987. Working report on second season of Japanese archaeological excavation in Saddam salvage project (Tell Jigan). *Research on the antiquities of Saddam dam basin salvage,* 62-67. Iraq : Republic of Iraq, Ministry of Culture &

Information, State Organization of Antiquities & Heritage, Saddam Dam Basin Salvage Project.

Fuji, H., Hiroyuki, Ii, Kawamata, M., Koike, Y., Matsumoto, K., Numoto, H., Oguchi, H., Yoshikawa, H., 1987. Working report on first season of Japanese archaeological excavation in Saddam salvage project. *Research on the antiquities of Saddam dam basin salvage,* 33-61. Iraq : Republic of Iraq, Ministry of Culture & Information, State Organization of Antiquities & Heritage, Saddam Dam Basin Salvage Project.

Gaffney, V., Laflin, S., and M. van Leusen (eds.), *Archaeology in the age of the Internet: Computer Applications and Quantitative methods in Archaeology 1997.* Oxford: Archaeopress.

al-Gailani Werr, L., 1988. *Studies in the Chronology and Regional Styles of Old Babylonian Cylinder Seals.* Malibu: Undena.

Gallant, T.W., 1986. Background noise and site definition: a contribution to survey methodology. *Journal of Field Archaeology,* 13, 403-418.

Galton, F., 1877. Typical laws of heredity. *Nature 15* (388, 389, 390), 492–495 ; 512–514 ; 532–533.

Garelli, P., 1989. Le marché de Burushattum. *Studies T. Özguç*, 149-152.

Garfinkle, S. J., 2013. Ancient Near Eastern City-States. In: Bang, P. F., and Scheidel, W., (eds.), The Oxford Handbook of the State in the Ancient Near East and Mediterranean. Oxford: Oxford University Press: 94-119.

Gasche, H., 1998. *Dating the Fall of Babylon. A Reappraisal of Second-Millennium Chronology.* Ghent: University of Ghent and the Oriental Institute of Chicago.

Gates, M. H., 1981. Alalakh Levels VI and V: A Chronological Reassessment. *Syro-Mesopotamian Studies 4/2,* 1-40.

Gerstenblith, P., 1983. *The Levant at the Beginning of the Middle Bronze Age.* American School of Oriental Research.

Gesuato, M. K., 1993. Pre-Islamic pottery from Tell Jikan. In: Wilhelm, G., and Zaccagnini, C. (eds.), *Tell Karrana 3. Tell Jikan. Tell Khirbet Salih.* Mainz: Baghdader Forschungen, Band 15, 269-280.

Geyer, B. And Monchambert, J. Y., 2003. *La basse valleé de l'Euphrates Syrien du Néolithique à l'avenement de l'Islam.* Beyrouth: Institut Francais du Proche Orient.

Glatz, C., Matthews, R., and Schachner, A., 2009. A Landscape of Conflict and Control: Paphlagonia during the Second Millennium BC. In: Matthews, R. and Glatz, C. (eds.), *At empires' edge: project Paphlagonia. Regional survey in North-Central Turkey*. London: British Institute at Ankara.

Goetze, A., 1953. An Old Babylonian itinerary. *Journal of Cuneiform Studies 7*, 51-72.

Goetze, A., 1964. Remarks on the Old Babylonian Itinerary. *Journal of Cuneiform Studies 18 (4)*, 114-119.

Goldman, H., (ed.) 1956. *Excavations at Gözlü Kule, Tarsus: From the Neolithic through the Bronze Age*. Princeton: Princeton University Press.

Goodnick Westebholz, J., 1998. Relations between Mesopotamia and Anatolia during the Age of the Sargonic Kings. In: *XXXIVeme Rencontre Assyriologique Internationale, 6-10/VII/1987, Istanbul.* Ankara: Kongreye Sunulan Bildiriler, 5-22.

Gorny, R., 2001. An Unpublished Relief Sherd from AlişarHöyük. In: S. R. Wolff (ed.), *Studies in the Archaeology of Israel and Neighboring Lands in Memory of Douglas L. Esse* Chicago: University of Chicago Press, 175-188.

Gosden, C., 2004. *Archaeology and Colonialism.* Cambrige: Cambridge University Press.

Graham, S., 2006a. *EX FIGLINIS, the network dynamics of the Tiber valley brick industry in*
the hinterland of Rome. *British Archaeological Reports International Series,* 1486. Oxford: Archeopress.

Graham, S., 2006b. Networks, Agent-Based Models and the Antonine Itineraries: Implications for Roman Archaeology. *Journal of Mediterranean Archaeology* 19, 45-64.

Graham, S., 2009. The space between: the geography of social networks in the Tiber valley. In F. Coarelli and H. Patterson (eds.), *Mercator Placidissimus: the Tiber Valley in antiquity. New research in the upper and middle river valley*. Rome: Edizioni Quasar.

Grayson, A. K., 1987. *Assyrian Rulers of the Third and Second Millennia BC (to 1115 BC).* Toronto: University of Toronto Press.

Gregg, S. A., Kintigh, K. W. and Whallon, R., 1991. Linking Ethnoarchaeological Interpretation and Archaeological Data: The Sensitivity of Spatial Analytical Methods to Postdepositional Disturbance. In: E. M. Kroll and T. D. Price (eds.), *The Interpretation of Archaeological Spatial Patterning*, New York: Plenum Press, 149–196.

Grieder, T., 1975. The interpretation of ancient symbols. *American Anthropologist 77*, 849-55.

Guichard, M., 2008. Nahur et la route des marchands assyriens à l'époque de Zimri-Lim. In: Dercksen, J. G. (ed.), *Anatolia and the Jazira during the Old Assyrian period*. Leiden: Nederlands Instituut Voor Het Nabije Oosten, 43-53.

Gülçür, S. 1995. Some Unknown Aspects of Western Cappadocia: Results of the 1993 Survey, in Çambel (ed.), *Readings in prehistory: studies presented to Halet Çambel*. Istanbul: Graphis, 149-73.

Günbatti, C., 2008. An Eponym list (Kel G) from Kültepe. *AoF 35-1*, 103-132.

Haber, W., 1995. *Concept, Origin, and Meaning of Landscape*. UNESCO's Cultural Landscapes of Universal Value: Components of a Global Strategy. New York: UNESCO.

Hafford, W. B., 2005. Hanging in the Balance: Precision Weighing in Antiquity. *Expedition 47*, 35-37.

Hafford, W. B., 2012. Weighing in Mesopotamia: The Balance Pan Weights from Ur. *Akkadica 133,* 21-65.

Hall, M. 1995. Comments on 'Oxhide ingots, recycling, and the Mediterranean metals trade'. *Journal of Meditrranean Archaeology 8*, 42-44.

Hallo, W. W., 1964. The Road to Emar. *Journal of Cuneiform Studies 18 (3),* 57-88.

Halperin, R. H., 1984. Polanyi, Marx, and the institutional paradigm in economic anthropology. *Research in Economic Anthropology 6*, 245-72.

Hamblin, W. G., 2006. *Warfare in the Ancient Near East to 1600 BC.* London and New York: Routledge.

Hamlin, C., 1971. *The Habur Ware ceramic assemblage of Northern Mesopotamia: an analysis of its distribution.* University Microfilms International: Ann Arbor, Michigan.

Hamlin, C., 1974. The Early Second Millennium Ceramic Assemblage of Dinkha Tepe. *Iran 12,* 125-146.

Hammade, H., 1994. *Cylinder Seals from the Collections of the Aleppo Museum, Syrian Arab Republic. 2. Seals of Known Provenance*. Oxford: BAR International Series.

Hansen, M. H., 2000. The concepts of City-State and City-State Culture. In: Hansen, M. H., (ed.), *A Comparative Study of Thirty City-State Cultures.* Copenhagen: Special-Trykkeriet Viborg.

Hansen, M.H., 2002. A comparative study of Six City-State Cultures. Copenhagen: Special-Trykkeriet Viborg.

Harary, F. and Norman, R. Z., 1953. *Graph Theory as a Mathematical Model in Social Science*. Ann Arbor.

Hare, S. T., 2004. Using measures of cost distance in the estimation of polity boundaries in the Postclassic Yautepec valley, Mexico. *Journal of Archaeological Science* 31, 799-814.

Harris, B., and Wilson, A.G., 1978. Equilibrium values and dynamics of attractiveness terms in production-constrained spatial interaction models. *Environment and Planning* A 10, 371-388.

Harris, T., 2000. Session 2 discussion: Moving GIS: exploring movement within prehistoric cultural landscapes using GIS. In: G. Lock (ed), *Beyond the map*: *Archaeology and Spatial Technologies* 116-123. Amsterdam: IOS Press.

Hawkins, J. D., 1976. The Inscribed Seal Impressions. In: Dalley, S., Walker, C. B. F. and Hawkins, J. D. (eds.), *The Old Babylonian Tablets from Tell al-Rimah*. London: British School of Archaeology in Iraq, 247-255.

Heimpel, W., 2003. *Letters to the King of Mari:A New Translation, with Historical Introduction, Notes, and Commentary.* Winona Lake.

Heinz, M., 1992. *Tell Atchana/Alalakh. Die Schichten VII-XVII.* Darmstadt: Verlag Butzon & Bercker Kevelaer.

Hertel, T., 2014. The Lower Town of Kültepe: Urban Layout and Population. In: L. Atici, F. Kulakoglu, G. Barjamovic, and A. Fairbairn (eds.), *Current Research at Kultepe/Kanesh: An Interdisciplinary and Integrative Approach to Trade Networks, Internationalism, and Identity (Journal of Cuneiform Studies Supplemental Series).* Atlanta: Lockwood Press, 25-54.

Herzog, I., 2012. Least-cost networks. In: Earl, G., Sly, T., Chrysanthi, A., Murrieta-Flores, P., Papadopoulos, C., Romanowska, I., and Wheatley, D. (eds.), *Archaeology in the Digital Era. Papers from the 40th Annual Conference of Computer Applications and Quantitative Methods in Archaeology (CAA), Southampton, England, 26-29 March 2012.* Amsterdam: Amsterdam University Press, 240-251.

Herzog, I., 2013. The Potential and Limits of Optimal Path Analysis. In: Bevan, A. and Lake, M. (eds.), *Computational Approaches to Archaeological Spaces.* Walnut Creek: Left Coast Press, 179-211.

Hinsley, F. H., 1986. *Sovereignity*. Cambridge: Cambridge University Press.

Hirsch, E., 1995. Landscape: between place and space. In: Hirsch, E and O'Hanlon, M. (eds.), *The Anthropology of landscape: Perspectives on Place and Space.* Oxford: Clarendon Press, 1-30.

Hirth, Kenneth G., 1978. Problems in Data Recovery and Measurement in Settlement Archaeology. *Journal of Field Archaeology 5*, 125-131.

Hockmann, D., 2010. *Gräber und Grüfte in Assur. I,Von der zweiten Hälfte des 3. bis zur Mitte des 2. Jahrtausends v. Chr.* Wiesbaden: Harrassowitz Verlag.

Hodder, I., and Orton, C. 1976. *Spatial Analysis in Archaeology.* Cambridge: Cambridge University Press.

Hoffner, A. H., 1980. Histories and Historians of the Ancient Near East: The Hittites. *Orientalia 49,* 283-332.

Hole, F., 1997. Evidence for Mid-Holocene Environmental Change in the Western Khabur Drainage, Northeastern Syria. In: H. N. Dalfes, G. Kukla, and H. Weiss (eds.), *Third Millennium B.C. Climate Change and Old Word Collapse.* Berlin and Heidelberg: Springer.

Horne, L. 1993: Occupational and locational instability in arid land settlement. In: C.M. Cameron and S.A. Tomka (eds.), *Abandonment of settlements and regions: ethnoarchaeological and archaeological approaches*. New Directions in Archaeology. Cambridge, 43–53.

Howey, M. C. L., 2007. Using multi-criteria cost surface analysis to explore past regional landscapes: a case study of ritual activity and social interaction in Michigan, AD 1200e1600. *Journal of Archaeological Science 34,* 1830-1846.

Howey, M. C. L., 2011. Multiple pathways across past landscapes: circuit theory as a complementary geospatial method to least cost path for modeling past movement. *Journal of Archaeological Science 38, 2523-2535.*

Hrouda, B., 1957. *Die bemalte Keramik des zweiten Jahrtausends in Nordmesopotamien und Nordsyrien* (Istanbuler Forschngen, Band 19). Berlin: Verlag Gebr. Mann.

Hrouda, B., 1989. Die Hābūr-Ware in neuerer Sicht. In: Emre, K., Mellink, M., Hroauda, B. and Özgüç, N. (eds.), *Anatolia and the Ancient Near East. Studies in honor of Tahsin Özgüç*, 205-214. Ankara; Türk Tarih Kurumu Basımevi.

Hudson, M., and Levine, B.A., 1996. *Privatization in the Ancient Near East and Classical World.* Cambridge: Peabody Museum.

Ibrahim, J., 1986. *Pre-Islamic settlement in Jazira*. Unpublished PHD thesis. Baghdad.

Imberti, S., Kockelmann, W., Celli, M., Grazzi, F., Zoppi, M., Botti, A., Sodo, A., Leo Imperiale, M., de Vries-Melein, M., Visser, D., and, Postma, H., 2008. Neutron diffractometer INES for quantitative phase analysis of archaeological objects. *Measurement Science and Technology 19,* 1-8.

Invernizzi, A., 1992. *Dal Tigri all'Eufrate*. Torino: Le lettere.

Isaac, B. L. 1993. Retrospective on formalist-substantivist debate. *Research in Economic Anthropology 14*: 213–33.

Isaksen, L. (2008). The application of network analysis to ancient transport geography: a case study of Roman Baetica. *Digital Medievalist 4*. Retrieved 25 April 2014 from http://www.digitalmedievalist.org/journal/4/isaksen/.

Isin, M.A. 1998. Sinop region field survey. *Anatolia Antiqua* 6, 95-139.

Jacobsen, T. and Adams, R. M., 1958. Salt and silt in ancient Mesopotamian agriculture. Progressive changes in soil salinity and sedimentation contributed to the breakup of past civilizations. *Science* 128, 1251–58.

Jean Marie, M., 1999. *Tombe set Necropoles de Mari*. Beyrouth: Institut Francais d'Archeologie di Proche-Orient.

Jennings, J., 2011. *Globalizations and the Ancient World.* Cambridge: Cambridge University Press.

Jessop, B., 1990. *State Theory: Putting the Capitalist State in Its Place.* Cambridge: Polity.

Joannès, F., 1996. Routes et voies de communication dans les archives de Mari. In: J.-M. Durand. (ed.)., *Amurru 1: Mari, Ébla et les Hourrites, dix ans de travaux, 1*. Paris: Éd. Recherche sur les civilisations, 323-361.

Johnson, A. W., and Earle, T., 2000. *The evolution of human societies: From foraging group to agrarian state*. Stanford: Stanford University Press.

Johnson, G. A., 1972. A test of the utility of central place theory in archaeology. In: P. Ucko, R. Tringham and G. W. Dimbleby, (Eds.), *Man, Settlement, and Urbanism*. Cambridge, MA: Shenkman Press, 769–785.

Johnson, G.A, 1977. Aspects of regional analysis in archaeology. *Annual Review of Anthropology 6,* 479–508.

Johnson, G. A., 1980. Rank-size convexity and system integration: a view from archaeology *Economic Geography 56*, 234–247.

Kantner, J., 2008. The archaeology of regions: from discrete analytical toolkit to ubiquitous spatial perspective. *Journal of Archaeological Research 16*, 37-81.

Kantor, H. J., 1958. The Pottery. In: McEwan, C. W., Braidwood, L. S., Frankfort, H., Guterbock, H. G., Haines, R. C., Kantor, H. J., Kraeling, C. H. (eds), *Soundings at Tell Fakhariyah,* 21-41. Chicago: The University of Chicago Press.

Karwiese, S., 1990. Šiklu, kitu und stater: der Weg zu einer neuen Metrologie des Altertums , I. Mesopotamien. In: Gyselen, R. (ed.), *Prix, salaires, poids et mesures.* Paris: Peeters, 9-118.

Kaschau, G., 1999. *Lidar Hüyük*. *Die Keramik Der Mittleren Bronzezeit*. Mainz: Verlag Philipp Von Zabern.

Kawamata, M., Ii, H., Oguchi, H., Yaga, K., Numoto, H., 1987. Tell Jikan. *Archiv fur Orientforscung.*

Kealhofer, L. 2005. Settlement and land use: the Gordion regional survey. In: Kealhofer, L. (ed.), *The Archaeology of Midas and the Phrygians: Recent Work at Gordion*, 137-148.

Keel-Leu, H., and Teissier, B., 2004. *Die vorderasiatischen Rollsiegel der Sammlungen "Bibel+Orient" der Universität Freiburg Schweiz = The ancient Near Eastern cylinder seals of the collections "Bible+Orient" of the University of Fribourg.* Fribourg: Academic Press.

Kelly-Buccellati, M., 1990. Three Seasons of Excavation at Tell Mozan. In: Eichler, S., Wäfler, M. and Warburton, D. (eds), *Tall al-Hamidiya. Orbis Biblicus et Orientalis: Series Archaeologica 6.* Göttingen, 119-132.

Kendall, D. G., 1974. Hunting Quanta. *Philosophical Transactions of the Royal Society London 276*, 231-266.

Kepinski, C., 2005. Tilbeshar – A Bronze Age City in the Sajur Valley (Southeast Anatolia). *Anatolica 31*, 145-159.

Klein, D. J., and M. Randic. 1993. Resistance distance. *Journal of Mathematical Chemistry 12,* 81–85.

Knapp, A. B., and Ashmore, W., 1999. Archaeological landscapes: constructed, conceptualized, ideational. In: Ashmore, W., and Knapp, A. B., (eds.), *Archaeologies of Landscape.* Oxford: Blackwell Publishers.

Knappett, C., Evans, T., and Rivers, R., 2008. Modelling maritime interaction in the Aegean Bronze Age. *Antiquity* 82, 1009-1024.

Kohl, P. L., 2011. World-Systems and Modelling Macro-Historical Processes in Later Prehistory: an Examination of Old and a Search for New Pesrpectives. In: T. C. Wilkinson, S. Sherratt and J. Bennet (eds.), *Interweaving worlds.* Oxford: Oxbow, 77-85.

Kolinski, R., 2014. 20th Century BC in the Khabur Triangle Region and the Advent of the Old Assyrian Trade with Anatolia. In: Bonatz, D. (ed.), *Archaeology of Political Spaces, The Upper Mesopotamian Piedmont in the 2nd Millennium BCE.* Berlin: Topoi – Berliner Studien in Antike Welt bd.12, 11-34.

Kontani, R., 2010. Observations on “Syrian Bottle” Shaped Imported Vessels from Kültepe. In: Kulakoğlu, F., and Kangal, S. (eds.), *Anatolia’s Prologue, Kültepe Kanesh Karum, Assyrians in Istanbul.* Istanbul: Kaisery Metropolitan Municipality Cultural Publication No. 78, 52-55.

Kowalewski, S., 1982. The evolution of primate regional systems. *Comparative Urban Research* 9**,** 60–78.

Kowalewski, S. A., 2008. Regional Settlement Pattern Studies. *Journal of Archaeological Research 16 (3)*, 225-285.

Kozbe, G., 2007. Kavuşan Höyük 2005 Yılı Kazısı. *Kazı Sonuçları Toplantısı 28/1*, 573-588.

Kozbe, G., 2010. Kavuşan Höyük Kazısı, 2008. *Kazı Sonuçları Toplantısı 31/4*, 173-196.

Kradin, N. N., 2002. Nomadism, evolution and world-systems: Pastoral societies in theories of historical development. *Journal of World-Systems Research 8:* 368-388.

Kroll, S., 1994. Habur-Ware im Osten oder: Der TAVO auf Irrewegen im Iranischen Hochland. In: Calmeyer, P. *et al.* (eds.), *Beiträge zur Altorientalischen Archölogie und Altertumskunde. Festschrift für Barthel Hrouda zum 65. Geburstag.* Wiesbaden: Harrassowitz Verlag, 156-166.

Krugman, P., Cooper, R. N., and Srinivasan, T. N., 1995. World Trade: Causes and Consequences. *Brookings Papers on Economic Activity, Vol. 1995, No. 1*, (1995), 327-377

Kühne, H. 1976. *Die Keramik von Tell Chuera und ihre Beziehungen zu Funden aus Syrien Palästina, der Türkei und dem Iraq*. Berlin: Gebr. Mann.

Kuhrt, A., 1995. *The Ancient Near East, c. 3000-330 BC.* London and New York: Routledge.

Kulakoğlu, F., 2003. Recently discovered bronze wagon models from Şanliurfa, Southeastern Anatolia. *Anadolu 24*, 63-77.

Kulakoğlu, F., 2008. A Hittite God from Kültepe. In: Michel, C. (ed.), *Old Assyrian Studies in Memory of Paul Garelli*. Leiden, 13-19.

Kulakoğlu, F., 2011a. Kültepe-Kaneš: A Second Millennium B.C.E. Trading Center on the Central Plateau. In: Steadman, S. H., and McMahon, G. (eds.), *Ancient Anatolia. 10,000-323 B.C.E.* Oxford: Oxford University Press, 1012-1030.

Kulakoğlu, F., 2011b. Kültepe Kanesh Karum: The Earliest International Trade Center in Anatolia. In: Kulakoğlu, F., and Kangal, S. (eds.), *Anatolia’s Prologue Kültepe*

Kanesh Karum – Assyrians in Istanbul. Kayseri: Kayseri Büyükşehir Belediyesi, 40-51.

Kulakoğlu, F., Emre, K., Kontani, R., Tsumura, H., and Ezer, S., 2009. Kayseri Arkeolojik Yüzey Araştırması Projesi (Kayap). 2008 Yılı Çalışmaları Sonuç Raporu, *Arastırma Sonuçları Toplantıs*ı 27(3), 305-318.

Kulakoğlu, F., Emre, K., Kontani, R., Tsumura, H., and Ezer, S., 2010. Kayseri Arkeolojik Yüzey Araştırması Projesi (Kayap). 2009 Yılı Çalışmaları Sonuç Raporu, *Arastırma Sonuçları Toplantıs*ı 28(3), 409-428.

Kulakoğlu, F., Emre, K., Kontani, R., Tsumura, H., and Ezer, S., 2011. Kayseri Arkeolojik Yüzey Araştırması Projesi (Kayap). 2010 Yılı Çalışmaları. *Arastırma Sonuçları Toplantıs*ı 29(3), 215-236.

Kull, B., 1988. *Demircihüyük: Die mittelbronzezeitliche Siedlung. Die Ergebnisse der Ausgrabungen 1975-78*. Mainz.

Kuzucuoğlu, C., Marro C., Özdogan, A. and Tibet, A. 1997. Prospection archéologique franco-turque dans la région de Kastamonu (mer Noire). Deuxième rapport préliminaire. *Anatolia Antiqua* 5, 275-306.

Kuzucuoğlu, C. and C. Marro, eds. 2007. *Sociétés humaines et changement climatique à la fin du troisième millénaire: une crise a-t-elle eu lieu en haute Mésopotamie? : actes du colloque de Lyon, 5-8 décembre 2005*. Vol.19, Varia Anatolica. Paris/Istanbul: Institut français d'études anatoliennes-Georges-Dumézil/De Boccard.

Kuzucuoğlu, C., Dörfler, W., Kunesch, S. and Goupille, F., 2011. Mid- to late-Holocene climate change in central Turkey: The Tecer Lake record. *The Holocene 21(1),* 173–188.

Ladefoged, T. N., and Pearson, R., 2000. Fortiied castles on Okinawa Island during the Gusuku Period, AD 1200-1600. *Antiquity 74,* 404-412

Laessøe, J., 1959. Akkadian Annakum: "Tin" or "Lead"? *Acta Orientalia 24*, 83-94.

Lamberg-Karlovski, C. C., 1972. Trade Mechanisms in Indus-Mesopotamian Interrelations. *Journal of the American Oriental Society 92(2)*: 222-30.

Larsen, M. T., 1972. A revolt against Hattuša. *Journal of Cuneiform Studies 24:* 100-101.

Larsen, M. T., 1976. *The Old Assyrian City-State and its Colonies*. Copenhagen: Akademisk Forlag.

Larsen, M. T., 1977. Seal Use in the Old Assyrian Period. *Bibliotheca Mesopotamica 6,* 81-105.

Larsen, M. T., 1982. Caravans and Trade in Ancient Mesopotamia and Asia Minor. *Bulletin of the Society of Mesopotamian Studies 4:* 33-45.

Larsen, M. T., 1987. Commercial networks in the Ancient Near East. In: Rowlands, M., Larsen, M. T. and Kristiansen, K., *Centre and Periphery in the Ancient World.* Cambridge: Cambridge University Press.

Larsen, M. T., and Lassen, A. W., 2014. Cultural Exchange at Kültepe. In: Kozuh, M., Henkelman, W. F. M., Jones, C. E., and Woods, C. (eds.), *Extraction & Control. Studies in Honor of Matthew W. Stolper.* Chicago: The Oriental Institute of the University of Chicago.

Lassen, A. W., 2008. *Textiles and Traders. A study of the technology, organization and socioeconomics of textile production in Anatolia in the Middle Bronze Age, c. 2000-1700 BC.* University of Copenhagen, unpublished PHD thesis.

Lassen, A. W., 2010. Wool trade in Old Assyrian Anatolia. *Jaarbericht "Ex Oriente Lux"* 42, 159-179.

Lassen, A. W., 2012. *Glyptic encounters: A stylistic and prosopographical study of seals in the Old Assyrian Period - Chronology, Ownership and Identity*. Unpublished PhD dissertation, University of Copenhagen.

Lassen, A. W., 2013. Technology and palace economy in Middle Bronze Age Anatolia: the case of the crescent shake loom weight. In: Nosch, M. L., and Kofoed, H. (eds.), *Textile Production and Consumption in the Ancient Near East: archaeology, epigraphy, iconography.*

Lassen, A. W., 2014. The Old Assyrian Glyptic Style. An Investigation of a Seal Style, Its Owners, and Place of Production. In: L. Atici, F. Kulakoğlu, G. Barjamovic, and A. Fairbairn (eds.), *Current Research at Kültepe-Kanesh (JCSSup 4).* Atlanta: Lockwood Press, 107-121.

Lebeau, M., 1983. Rapport Preliminaire sur la ceramique du Chantier A. *M.A.R.I. 2*, 165-193.

Lehner, J., A.K. Yener, and J. Burton. 2009. Lead isotope analysis characterisation of metallic residues of an Early Bronze Age crucible from Göltepe using ICP-MS. *TÜBA-AR 12*:165-74.

Lehner, J., 2012. Boğazköy Metal Buluntularının Mikroyapısı ve Mikroanalizi Hakkındaki Ön Rapor. *Arkeometri Sonuçları Toplantası 27,* 261-276.

Lemaire, T., 1997. Archaeology between the invention and destruction of the landscape. *Archaeological dialogues 4:* 5-21.

Lewy, H., 1958. Šubat-Šamaš and Tuttul. *Orientalia 27*, 1-18.

Li, X. J., Bevan, A., Martinon-Torres, M., Rehren, T., Cao, W., Xia, Y., and Zhao, K. Crossbows and imperial craft organisation: the bronze triggers of China's Terracotta Army. *Antiquity 88*, 126-140.

Littauer, M. A., and Crouwel, J. H., 1979. *Wheeled Vehicles and Ridden Animals in the Ancient Near East.* Leiden: Brill.

Liverani, M., 1965. *Missione Archeologica Italiana in Siria, Rapporto preliminare della campagna 1964.* Roma: Università "La Sapienza".

Liverani, M., 1984. Land tenure and inheritance in the ancient Near East: The interaction between "palace" and "family" sectors. In: Khalidi, T. (ed.), *Land Tenure and Social Transformation in the Middle East.* Beirut: American University of Beirut, 33-44.

Liverani, M., 1988. *Antico Oriente. Storia, Società, Economia.* Bari: Laterza.

Liverani, M., 2000. The role of the village in shaping the ancient Near Eastern Landscapes. In: Milano, L., (ed.), *Landscapes : territories, frontiers and horizons in the ancient Near East : papers presented to the XLIV Rencontre Assyriologique Internationale Venezia, 7-11 July 1997*. Padova: Sargon, 37-47.

Liverani, M., 2005. The Near East: The Bronze Age. In: Manning, J.G, and Morris, I., (eds.), *The Ancient Economy. Evidence and Models.* Stanford, CA: Stanford University Press.

Llobera, M., 2000. Understanding movement: A pilot model towards the sociology of movement. In: Lock, G. (ed.), *Beyond the Map: Archaeology and Spatial Technologies*, 65-84. Amsterdam: IOS Press.

Lloyd, S., 1938. Some Ancient Sites in the Sinjar District. *Iraq 5,* 123-142.

Lloyd, S., 1956. *Early Anatolia: The Archaeology of Asia Minor before the Greeks*. Harmondsworth: Penguin.

Lloyd, S. and Brice, W., 1951. Harran. *Anatolian Studies 1*, 77-111.

Luckenbill, D. D., 1989. *Ancient Records of Assyria and Babylonia.* London: Histories & Mysteries of Man Ltd.

Lyonnet, B., 1996. La prospection archéologique de la partie occidentale du Haut-Khabur (Syrie du N.E.): méthodes, résultats et questions autour de l'occupation aux IIIe et IIemill´enaires av. n.é. In: J.-M. Durand (ed.), *Amurru: Mari, Ebla et les Hourrites, dix ans de travaux, 1`ere partie* (Actes du colloque international, Paris, Mai 1993). Paris: Recherche sur les Civilisations, 363-76.

Lyonnet, B. ,1997. Questions sur l'origine des porteurs de pots en Haute-Mésopotamie, duVIe au millieu de IIe millénaire. In: D. Charpin and J.-M. Durand. (eds.), *FlorilegiumMarianum 3: Recueil d'études à la mémoire de Mari-Thérèse Barrelet. Mémoires de NABU 4.* Paris: SEPOA, 133-144.

Lyonnet, B., 2000. *Haut-Khabur Occidental.* Beyrouth: Institut Francais du Proche Orient.

Luckenbill, D. D., 1989. *Ancient Records of Assyria and Babylonia.* London: Histories & Mysteries of Man Ltd.

van Loon, M. N., 1980. *Korucutepe 3*. Amsterdam: North-Holland Publishing Company.

Lündstrom, S., 2013. Revising the Building History of the Old Palace in the City of Ashur. In: D. Kertai and P.A. Miglus (eds.), *New Research on Late Assyrian Palaces. Conference at Heidelberg January 22nd, 2011*. Heidelber: Heidelberger Orientverlag, 23-29.

MacNeish, R. S., Peterson, F. A. and Flannery, K. V., 1970. *The prehistory of the Tehuacan Valley,* vol. 3. University of Texas Press: Austin.

Madry, S. and Rakos, L.,1996. Line-of-sight and cost surface techniques for regional archaeological research in the Arroux River Valley. In: Maschner, H. D. G. (ed.), *New Methods, Old Problems: Geographic Information Systems in Modern Archaeological Research*,104-126.Southern Illinois University Center for Archaeological Investigations, Carbondale.

Mallowan, M. E. L., 1936. The Excavations a Tall Chagar Bazar, and an Archaeological Survey of the Habur Region, 1934-5. *Iraq 3*, 1-86.

Mallowan, M. E. L., 1937. The Excavations at Tell Chagar Bazar and an Archaeological Survey of the Khabur Region, Second Campaign, 1936. *Iraq 4*, 91-177.

Mallowan, M. E. L., 1946. Excavations in the Balikh Valley, 1938. *Iraq 8,* 111-159.

Manning, S. W., Kromer,B., Ramsey, C. B., Pearson, C. L., Talamo, S., Trano, N., and Watkins, J. D., 2010. 14C record and wiggle-match placement for the Anatolian (Gordion Area) Juniper tree-ring chronology ~1729 to 751 CAL BC, and typical Aegean/Anatolian (growing season related) regional 14C offset assessment. *Radiocarbon 52/4*, 1571-1597.

Marchetti, N., 2003. Notes on an Old Syrian Seal. Impression from Sippar. *Iraq 65*, 161-169.

Marchetti, N., 2010. A preliminary Report on the 2007 and 2008 Excavations and Restorations at Tilmen Höyük. In: P. Matthiae, F. Pinnock, L. Nigro, and N. Marchetti (eds.), *Proceedings of the 6th International Congress on the Archaeology of the Ancient Near East. May 5th-10th, 2008, "Sapienza"- Universita' di Roma.*Wiesbaden: Harrassowitz, 369-83.

Marchetti, N., 2011. *Kinku. Sigilli dell'Eta' del Bronzo nella regione di Gaziantep in Turchia.* Bologna: Ante Quem.

Marchetti, N., and Nigro, L., 1997. Cultic Activities in the Sacred Area of Ishtar at Ebla during the Old Syrian Period: The “Favissae” F. 5327 and F. 5238. *Journal of Cuneiform Studies 49*, 1-44.

Marcus, A., 1989. From Centralized Systems to City-States: Possible Models for the Epiclassic. In: Diehl, R. A., and Berlo, J. C., (eds.), *Mesoamerica after the Decline of Teotihuacan, A.D. 700-900*. Washington, D.C.: Dumbarton Oaks Research Library and Collection, 201-208.

Marcus, J., 1998. The peaks and valleys of ancient states: An extension of the dynamic model. In: Feinman, M., and Marcus, J., (eds.), *Archaic States*. Santa Fe, NM: School of American Research Press.

Marro, C., 1997. *La culture du Haut-Euphrate au Bronze Ancien. Essai d’interpretation a partir de la ceramique peinte de Keban.* Paris: Institute Francais d’Etudes Anatoliennes d’Istanbul.

Marro, C., Özdoğan A., and Tibet, A. 1998. Prospection archéologique franco-turque dans la région de Kastamonu (mer Noire). Troisième rapport préliminaire. *Anatolia Antiqua* 6, 317-335.

Marx, K., 1967. *Capital: A Critique of Political Economy. Volume 1: The Process of Capitalist Production*. New York: Int. Publ.

Massa, M., 2014. Destructions, abandonments, social reorganisation and climatic change in west and central Anatolia at the end of the third millennium BC. In: B. Erciyas and E. Sökmen (eds.), *Regional Studies in Archaeology Symposium Proceedings*. Istanbul: Ege Yayınları, 101-23.

Massa, M., forth. *Networks before Empires: cultural transfers in west and central Anatolia during the Early Bronze Age*. University College London, Unpublished PhD dissertation.

Matouš, L., and Matoušová-Rajimová, M., 1984. *Kappadokische Keislchrifttafeln mit Siegeln aus den Sammlung der Karluniversität.* Prague: Karlsuniversität.

Matthews, R., 2003. *The Archaeology of Mesopotamia*. London: Routledge.

Matthews, R. and Glatz, C., 2009. *At empires' edge: project Paphlagonia. Regional survey in North-Central Turkey*. London: British Institute at Ankara.

Matthews, D. and Eidem, J., 1993.Tell Brak and Nagar. *Iraq 55*, 201-207.

Matthews, R. J., Matthews, W. and McDonald, H., 1994. Excavations at Tell Brak, 1994. *Iraq 56,* 177-194.

Matthiae, P., 1969. Empreintes d'un cylinder paleosyrien de Tell Mardikh. *Syria 46*, 1-43.

Matthiae, P., 1977. *Ebla. Un Impero ritrovato.* Bari: Laterza.

Matthiae, P., 1994. The Lions of the Great Goddess of Ebla: A Hypothesis about some Archaic Old Syrian Cylinders. In: Gasche, H. et al. (eds.), *Cinquante-deux reflexions sur le Proche-Orient ancien, offertes en hommage a Leon de Meyer*. Leuven: Peeters, 329-338.

Matthiae, P., 1995. *Ebla, un impero ritrovato*. Torino: Einaudi.

Matthiae, P., Pinnock, F. and Scandone Matthiae, G., 1995. *Ebla. Alle origini della civiltà urbana*. Milano: Electa.

Mazar, A., 1990. *Archaeology of the Land of the Bible, 10,000-586BC.* New York: Doubleday.

Mazzoni, S., 1988. Problèmes et questions ouvertes nell'archeologia orientale. *Vicino Oriente 7*.

McCoy, M., and Ladefoged, T. N., 2009. New developments in the use of spatial technology in archaeology. *Journal of Archaeological research 17 (3)*, 263-295.

McDonald, H. and Jackson, N., 2003. A House on the Hill. Second-millennium Investigations: the Middle Bronze Age. In: Matthews, R. (ed.), *Excavations at Tell Brak. Vol.4: Exploring an Upper Mesopotamian regional centre, 1994-1996,* 271-320. Cambridge: British School of Archaeology in Iraq.

McEwan, C. W., Braidwood, L. S., Frankfort, H., Guterbock, H. G., Haines, R. G., Kantor, H. J., and Kraeling, K. H., 1958. *Soundings at Tell Fakhariyah.* Chicago: University of Chicago Press, 8

McMahon, A., 2009. *Once There Was a Place: Settlement Archaeology at Chagar Bazar, 1999-2002.* London: British Institute for the study of Iraq.

McMahon, A., Tunca, O., and Baghdo, A. M., 2001. New Excavations at Chagar Bazar, 1999-2000. *Iraq 63*, 201-222.

McRae, B. H., 2006. Isolation by resistance. *Evolution 60,* 1551–1561.

McRae, B.H., 2012. Centrality Mapper Connectivity Analysis Software. The Nature Conservancy, Seattle WA. Available at: http://www.circuitscape.org/linkagemapper.

McRae, B. H., and P. Beier. 2007. Circuit theory predicts gene flow in plant and animal populations. *Proceedings of the National Academy of Sciences (USA) 104*, 19885–19890.

McRae, B. H., Dickson, B. G., Keitt, T. H. and Shah, V. B., 2008. Using Circuit Theory to Model Connectivity in Ecology, Evolution and Conservation. *Ecology 89 (10)*, 2712-2724.

McRae, B.H. and Shah, V.B., 2011. *Circuitscape User Guide. ONLINE*. The University of California, Santa Barbara. Available at: http://www.circuitscape.org.

McRae, B. H., Hall, S. A., Beier, P. and Theobald, D. M., 2012. Where to Restore Ecological Connectivity? Detecting Barriers and Quantifying Restoration Benefits. *PLoS ONE 7 (12),* e52604. doi:10.1371/journal.pone.0052604.

McRae, B.H. and Kavanagh, D.M., 2014. *Linkage Mapper Connectivity Analysis Software*. The Nature Conservancy, Seattle WA. Available at: http://www.circuitscape.org/linkagemapper.

Meek, T. J., 1922. *Old Akkadian, Sumerian and Cappadocian tablets from Nuzu. Harwar Semitic Studies.* Cambridge.

Meijer, D. J. W., 1986. *A Survey in Northeastern Syria.* Leiden: Nederlands Historisch-Archaeologisch Institute Instanbul.

Meijer, D. J.W, 1998. Rich Man Poor Man. Two Sealings on a Tag from Hammam al Turkman. In: Lebeau, M. (ed.), *About Subartu. Studies devoted to Upper Mesopotamia. Subartu IV/2.* Turnhout: Brepols, 217-221.

Mellink, M. J., 1988. Archaeology in Anatolia. *American Journal of Archaeology 92,* 110-111.

Mellink, M.J. 1989. Anatolian and Foreign Relations of Tarsus in the Early Bronze Age, in Emre, Hrouda, Mellink and Özgüç (eds.), *Anatolia and the Ancient Near East: Studies in Honour of Tahsin Özgüç*. Ankara: Türk Tarih Kurumu, 319-31.

Mederos, A., and Lamberg-Karlowsky, C. C., 2004. Weight Systems and Trade Networks in the Old World (2500-1000 BC). In: Hudosn, M. and Wunsch, C. (eds.), *Creating Economic Order. Record-keeping, Standardization, and the Development of Accounting in the Ancient Near East.* Maryland: Beteshda.

Mellaart, J., 1963. Early Cultures of the South Anatolian Plateau, II: The Late Chalcolithic and Early Bronze Ages in the Konya Plain, *Anatolian Studies* 13:199-236.

Mellaart, J., 1981. Anatolia and the Indoeuropeans, *Journal of Indoeuropean Studies* 9:135-49.

Mellart, J., 1982. Archaeological Evidence for Trade and Trade Routes Between Syria and Mesopotamia and Anatolia During the Early and the Beginning of the Middle Bronze Age. *Studi Eblaiti* 5,15-32.

Mellink, M., 1987. Archaeology in Asia Minor. *American Journal of Archaeology 91*, 1-30.

Menze, B. H., Ur, J. A., and Sherratt, A., 2006. Detection of Ancient Settlement Mounds: Archaeological Survey Based on the SRTM Terrain Model. *Photogrammetric Engineering & Remote Sensing 72*, 321-27.

Menze, B. H., and J. A., Ur, 2012. Mapping Patterns of Long-Term Settlement in Northern Mesopotamia at a Large Scale. *Proceedings of the National Academy of Sciences* 109, 778-787.

Meyer, J. C., 2006. Trade in Bronze Age and Iron Age, a comparison. In: Bang, F. P., Ikeguchi, M., and Ziche, H. G., (eds.), *Ancient Economies Modern Methodologies.* Bari: Edipuglia, 89-106.

Michel, C. and Rocher, P., 2000. La cronologie du II millenarie revue à l'ombre d'un éclipse de soleil. *Jaarbericht Ex Oriente Lux 35-36*.

Michel, C., 2001. *Correspondance des marchands de Kaniš au début du IIe millenaire a.v. J.-C.* Paris: Édition du Cerf.

Michel, C., 2008. Nouvelle données de géographie historique Anatolienne d'après des archives récentes de Kültepe. *Eothen 16*, 235-252.

Miglus, P., and Strommenger, E., 2007. *Der Palast A*. Wiesbaden: Harrassowitz Verlag.

Mikami, T. and Omura, S., 1988. 1986. Kirsehir ili sinirlari içinde yapilan yüzey arastirmalari. *Arastirma Sonuçlari Toplantisi 5(2),* 123-156.

Miller, J. L., 2001. Anum-Hirbi and his Kingdom. *AoF 28,* 65-101.

Mills, B. J., Roberts, J. M. Jr., Clark, J. J., Haas, W. R. Jr., Peeples, M. A., and Borck, L., 2012. The dynamics of social networks in the Late Prehispanic U.S. southwest. In: C. Knappett and R. Rivers (eds.), *New approaches in regional network analysis.* Oxford: Oxford University Press.

Mizoguchi, K., 2009. Nodes and edges: a network approach to hierarchisation and state formation in Japan. *Journal of Anthropological Archaeology 28*(1), 14–26.

Moore, A.M.T., Hillman, G.C., and Legge, A.J., 2000. Village on the Euphrates. Oxford: Oxford University Press.

Moortgat, A., 1959. *Archäologische Forschungen der Max Freiherr von Oppenheim-Stiftung im nördlichen Mesopotamien 1956.* Köln: Westdeutscher Verlag.

Morandi Bonacossi, D., and Eidem, J., 2006. A Royal Seal of Ishhi-Addu, King of Qatna. Akkadica 127, 41-57.

Muhly, J.D. 1995. Lead isotope analysis and the archaeologists. *Journal of Meditrranean Archaeology 8*, 54-8.

Mulder, J. J., 2008. *Potential sources of iron oxides found in Mesopotamia*. Unpublished BA dissertation.

Mulder, J. J., 2010. Comparing the Composition of Mesopotamian Iron Oxide Stone Duck Weights, Cylinder Seals and Half-Fabricates, using X-Ray Fluorescence and Neutron Radio and Tomography. Unpublished MA dissertation.

Murdock, G., 1949. *Social Structure.* New York: The Macmillan Company.

Murrieta-Flores, P., 2012. Understanding human movement through spatial technologies. The role of natural areas of transit in the Late Prehistory of South-western Iberia. *Trabajos de Prehistoria 69 (1),* 103-122.

Mustonen, S., 2012. Hunting multiple quanta by selective least squares. Retrieved on 22 February 2014 from World Wide Web: http://www.survo.fi/publications/index.html

Nashef, K., 1987. *Rekonstruktion der Reiserouten zur Zeit der altassyrischen Handelniederlassungen*, (Beiträge zum Tübinger Atlas des Vorderen Orients, Beiheft B 83), Wiesbaden.

Neugebauer, O., and Sachs, A., 1945. *Mathematical Cuneiform Texts*. New Haven: American Oriental Society.

Neumann, J., 1987. *Handwerk in Mesopotamien*. Berlin.

Newman, M. E. J., 2010. *Networks: an introduction*. Oxford: Oxford University Press.

Newton, M. W., and Kuniholm, P. I., 2004. A Dendrochronological Framework for the Assyrian Colony Period in Asia Minor. *Turkiye Bilimler Akademisi Arkeoloji Dergisi 7,* 165-176.

Neve, P., 1982. *Buyukkale. Die Bauwerke*. Berlin: Gebr. Mann Verlag.

Neve, P., 1984. Ein althethitischer Sammelfund aus der Unterstadt. In: K. Bittel (ed.), *Boğazköy VI. Funde aus den Grabungen bis 1979*. Berlin, 63-89.

Nicolle, C., 2006. *Tell Mohhammed Diyab 3. Travaux de 1992-2000 sur les buttes A et B.* Paris: Editions Recherche sur les Civilisations.

Nigro, L., 2002. The Middle Bronze Age Pottery Horizon of Northern Inner Syria on the Basis of the Stratified Assemblages of Tell Mardikh and Hama. In: al-Maqdissi, M., Matoian, V., and Nicolle, C. (eds.*), Cèramique de l'Age du*

Bronze en Syrie. Beyrouth: Instutut Francais d'Archéologie du Proche Orient, 97-128.

Nooy, W. D., Mrvar, A. and Batagelj, V., 2005. *Exploratory social network analysis with Pajek*. *Structural analysis in the social sciences*. Cambridge: Cambridge University Press.

North, DC., 1981. *Structure and Change in Economic History*. New York: Norton

Numoto, H., 1988. Excavations at Tell Fisna, *al-Rāfidan 9,* 1-71.

Numoto, H., 1990. Findings from Tell Jessary. *Al-Rafidan 11,* 201-244.

Nystuen, J. D. and Dacey, M. F., 1961. A graph theory interpretation of nodal regions. *Pap. Proc. Reg. Sci. Assoc. 7*, 29-42.

Oates, D., 1970. The excavations at Tell al Rimah 1968. *Iraq 32,* 16-20.

Oates, D. and Oates, J., 1970. Tell Brak: a stratigraphic summary. *Ira 56*, 167-176.

Oates, D., Oates, J. and McDonald, H., 1997. *Excavations at Tell Brak. Vol. 1: The Mitanni and Old Babylonian periods.* Cambridge: British School of Archaeology in Iraq.

Oates, D., Oates, J., McDonald, H., 2001. *Excavations at Tell Brak. Vol. 2: Nagar in the third millennium BC.* Cambridge: McDonald Institute for Archaeological Research.

Oates, D., and Oates, J., 1994. Tell Brak: A stratigraphic Summary. *Iraq 156,* 167-176.

Oates, J., 1968. *Studies in the ancient history of the northern Iraq.* London.

Oded, B., 1992. *War, Peace, and Empire: Justifications for War in Assyrian Royal Inscriptions.* Wiesbaden: Dr. Ludwig Reichert Verlag.

Offe, C., and Ronge, V., 1997. Theses on the Theory of the State. In: Goodin, R.E., and Pettit, P., (eds.), *Contemporary Political Philosophy: An Anthology.* Oxford: Blackwell, 60-65.

Oguchi, H., 1997a. *The Old Assyrian Period: Trade, Trade Routes and the Role of the Area of Distribution of Khabur Ware.* Phd unpublished thesis. University of Manchester.

Oguchi, H., 1997b. A reassessment of the distribution of Khabur Ware: an approach from an aspect of its main phase. *Al-Rafidan 18,* 195-224.

Oguchi, H., 1998. Notes on Khabur ware from sites outside its main distribution zone. *Al-Rafidan 19,* 119-133.

Oguchi, H., 1999. Trade routes in the Old Assyrian period. *Al-Rafidan 20,* 85-106.

Oguchi, H., 2006. The date of the beginning of Khabur Ware Period 3. *Al-Rafidan 27,* 45-58.

Ökse, A.T. 1994. Sivas ili 1992 yuzey arastırması. *Arastırma Sonuçları Toplantısı* 11, 243-258.

Ökse, A.T. 1995. Sivas ili 1993 yuzey arastırması. *Arastırma Sonuçları Toplantısı* 12, 317-329.

Ökse, A.T. 1996. Sivas ili 1994 yuzey arastırması. *Arastırma Sonuçları Toplantısı* 13(1), 205-228.

Ökse, A.T. 1997. Sivas ili 1995 yuzey arastırması. *Arastırma Sonuçları Toplantısı* 14(2), 375-400.

Ökse, A.T. 1999. Sivas ili 1997 yuzey arastırması. *Arastırma Sonuçları Toplantısı* 16(1), 467-490.

Ökse, A.T. 2000. Sivas ili 1998 yuzey arastırması. *Arastırma Sonuçları Toplantısı* 17(2), 11-24.

Ökse, A.T. 2001. Sivas ili 1999 yuzey arastırması. *Arastırma Sonuçları Toplantısı* 18(2), 89-100.

Ökse, A.T. 2007. Ancient Mountain Routes Connecting Central Anatolia to the Upper Euphrates Region, *Anatolian Studies* 57, 35-45.

Ökse, A. T., Görmüş, A., and, Bilici, M. A., 2010. Ilısu Barajı - Salat Tepe 2008 Kazısı. *Kazı Sonuçları Toplantısı 31/1*, 317-330.

Ollson, O., and Hibbs, D., 2005. Biogeography and long-run development. *European Economic Review 49:* 909-938.

Omura, S., 1992. 1990 yılı orta Anadolu'da yurutulen yuzey arastırmaları. *Arastırma Sonuçları Toplantısı 9*, 541-560.

Omura, S., 1993. 1991 yili iç Anadolu'da yürütülen yüzey arastirmalari. *Arastırma Sonuçları Toplantısı 10*, 365-386.

Omura, S.,1994. 1992 yili iç Anadolu'da yürütülen yüzey arastirmalari. *Arastırma Sonuçları Toplantısı 11,* 311-336.

Omura, S. 1995. 1993 yili iç Anadolu'da yürütülen yüzey arastirmalari. *Arastırma S onuçları Toplantısı 12*, 215-244.

Omura, S., 1996. 1994 yili iç Anadolu'da yürütülen yüzey arastirmalari. *Arastırma Sonuçları Toplantısı 13(2)*, 243-272.

Omura, S., 1996b. A preliminary Report of the General Survey in Central Anatolia (1994), *Bulletin of the Middle Eastern Culture Center in Japan 9*, 135-192.

Omura, S., 1997. 1995 yili iç Anadolu'da yürütülen yüzey arastirmalari, Arastırma Sonuçları Toplantısı 14(2), 283-302.

Omura, S., 1998. 1996 yili iç Anadolu'da yürütülen yüzey arastirmalari, Arastırma Sonuçları Toplantısı 15(2), 41-50.

Omura, S., 2000. Preliminary report of the general survey in Central Anatolia (1999), Anatolian Archaeological Studies 9. Kaman-Kalehöyük 9, 37-96.

Omura, S., 2001a. 1999 yili iç Anadolu'da yürütülen yüzey arastirmalari, Arastırma Sonuçları Toplantısı 18(2), 83-88.

Omura, S., 2001b. Preliminary report of the general survey in Central Anatolia (2000), Anatolian Archaeological Studies 10. Kaman-Kalehöyük 10, 37-86.

Omura, S., 2002. Preliminary report of the general survey in Central Anatolia (2001), Anatolian Archaeological Studies 11. Kaman-Kalehöyük 11, 45-112.

Omura, S., 2003. Preliminary report of the general survey in Central Anatolia (2002), Anatolian Archaeological Studies 11. Kaman-Kalehöyük 12, 37-88.

Omura, S., 2006. Preliminary report of the general survey in Central Anatolia (2005), Anatolian Archaeological Studies 15. Kaman-Kalehöyük 15, 63-102.

Omura, S., 2007a. Preliminary report of the general survey in Central Anatolia (2006), Anatolian Archaeological Studies 16. Kaman-Kalehöyük 16, 45-84.

Omura, S., 2007b. 2003-2006 yillarinda iç Anadolu'da yapilmiş olan yüzey arastirmalari, Arastırma Sonuçları Toplantısı 25(2), 213-224.

Omura, S., 2008. Preliminary report of the general survey in Central Anatolia (2007), Anatolian Archaeological Studies 17. Kaman-Kalehöyük 17, 45-92.

Omura, S., and Kashima, K., 2002. The Geo-Archaeological Program at Kaman Kalehöyük and its Surroundings. *Arkeometri Sounuçları Toplantısı 17,* 119-125.

Orton, C., and Hodder, I., 1976. *Spatial Analysis in Archaeology.* Cambridge University Press.

Orton, C., 2000. *Sampling in Archaeology*. Cambridge: Cambridge University Press.

von der Osten,H. H., 1937. *The Alishar Hoyuk. Seasons of 1930-32. Part II*. Chicago: Oriental Institute of the university of Chicago.

Otto, A., 1998. A Middle Bronze Age Cylinder Seal from the Jar Burial F 167 at Tell Ahmar. *Abr-Nahrain 35*, 120-134.

Otto, A., 2000. *Die Entstehung und Entwicklung der Klassisch-Syrischen Glyptik.* Berlin: De Gruyter.

Otto, A., 2004. *Tell Bi'a/Tuttul-IV. Siegel Und Siegelabrollungen*. Saarbrucken: Saarbrucker Druckerei Und Verlag.

Özdogan, M. *The Lower Euphrates Basin 1977 Survey.* Ankara: East Technical University Lower Euphrates Publications.

Özdoğan, M., Marro, C., and Tibet, A. 1997. Kastamonu yüzey araştırması (1995). *Arastırma Sonuçları Toplantıs*ı *14(2),* 303-330.

Özdoğan, M., Marro, C., and Tibet, A. 1999. Kastamonu yüzey araştırması 1997 yılı çalişmaları. *Araştırma Sonuçları Toplantısı 16(2),* 219-244.

Özdoğan, M., Marro, C., Tibet, A., and Kuzucuoğlu, C. 2000. Kastamonu yüzey araştırması 1998 yılı çalişmaları. *Araştırma Sonuçları Toplantısı 17(2)*, 41-45.

Özfirat, A., 2002. Khabur Ware from Hakkâri. *Ancient Near Eastern Studies 39,* 141 - 151.

Özgüç, N., 1965. *The Anatolian group of cylinder seal impressions from Kültepe*. Ankara: Turkish Historical Society Publications.

Özgüç, N., 1968. *Seals and seal impressions of level Ib from Karum Kanish.* Ankara: Turkish Historical Society Publications.

Özgüç, N., 1971. A stamp seal from Nigde Region and four Seal Impressions found in Acemhoyuk. *Anatolia 15*, 17-28.

Özgüç, N., 1980. Seal Impressions from the Palaces at Açemhüyük. In: Porada, E. (ed.), *Ancient Art and Seals.* Princeton: Princeton University Press, 61-80.

Özgüç, N., 2001.Notes on the Bronze Vehicle from the Sarıkaya Palace at Acemhöyük. In: W.H. van Soldt (ed.), *Veenhof Anniversary Volume. Studies Presented to Klaas R. Veenhof on the Occasion of the Sixty-Fifth Birthday*. Leiden: Nederlands Instituut voor het Nabije Oosten, 361-366.

Özgüç, N., 2006. *Kültepe-Kanish/Nesha. Seal Impressions of the Clay Envelopes from the Archives of the Native Peruwa and Assyrian Trader Usur-sha-Ishtar son of Asshur-imitti*. Ankara: Turkish Historical Society Publications.

Özgüç, N., and Tunca, O., 2001. *Kültepe-Kanish. Sealed and inscribed clay bullae*. Ankara: Turkish Historical Society Publications.

Özgüç, T., 1953. Vorläufiger Bericht über die Grabungen von 1950 in Kültepe Ausgeführt im Auftrage des Türk Tarih Kurumu. *Belleten 17,* 109-118.

Özgüç**,** T., 1963. An Assyrian Trading Outpost. *Scientific American 207 /3*, 235-242.

Özgüç, T., 1964. The Art and Architecture of Ancient Kanesh. *Anatolia 8, 27-48.*

Özgüç, T., 1986a. New Observations on the Relationship of Kültepe with Southeast Anatolia and North Syria during the Third Millennium B. C. In: Canby, J. V., Porada, E., Ridgway, B. S., Stech, T. (eds.), *Ancient Anatolia. Aspects of Change and Cultural Development. Essays in Honor of Machteld J. Mellink.* Madison: The University of Wisconsin Press.

Özgüç, T., 1986b. *Kültepe-Kaniş II: Eski Yakındoğuínun ticaret merkesinde yeni araştırmalar : New researches at the trading center of the ancient Near East.* Ankara: Türk Tarih Kurumu Basımevi.

Özgüç, T., 1989. Bullae from Kültepe. In: Özgüç, T. and Emre, K. (eds.), *Anatolia and the ancient Near East : studies in honor of Tahsin Özgüç*. Ankara: Türk Tarih Kurumu Basımevi, 377-405.

Özgüç T., 1999. *Kültepe-Kaniş/Neşa Saraylari ve Mabetleri/The Palaces and Temples of Kültepe-Kaniş/Neşa.* Ankara: Türk Tarih Kurumu Basimevi.

Özgüç, T., 2003. *Kultepe-Kanis/Nesa. The Earliest International Trading Center and the Oldest capital of the Hittites.* Tokyo: The Middle Eastern Culture Center.

Özgüç, T., and Özgüç, N., 1953. *Ausgábungen in Kültepe. Bericht über die in Auftrage der Türkischen Hisotorischen Gsellschaft, 1949 Durchgefürtne Ausgrabungen.* Ankara: Türk Tarih Kurumu Basimevi .

Özsait, M., 1991. 1989 yılı Göynücek çevresi tarihöncesi araştırmaları. *Arastırma Sonuçları Toplantıs*ı 8, 45-54.

Özsait, M., 1998. 1995 ve 1996 Yillarinda Amasya – Merzifon ve Gümüshaciköy yüzey arastirmalari. *Arastırma Sonuçları Toplantıs*ı 15(2), 143-161.

Özsait, M., 1999. 1997. Yılı Tokat ve Çevresi yuzey arastırmaları. *Arastırma Sonuçları Toplantıs*ı 16(2): 89-107.

Özsait, M., 2000. 1997 ve 1998 Yılı Tokat-Zile ve çevresi yüzey arastırmaları. *Arastırma Sonuçları Toplantısı* 17(2), 73-88.

Özsait, M. 2002. 1999-2000 Yılı Amasya-Merzifon ve Ordu–Kumru yüzey aradtırması. *Aradtırma Sonuçları Toplantısı* 19(2), 191-216.

Özsait, M. 2003. 2001 Yılı Samsun ve Amasya yüzey arastırmaları. *Arastırma Sonuçları Toplantısı* 20(2), 127-150.

Özsait, M. 2004. 2002 Yılı Samsun-Amasya yüzey arastırmalarının ilk sonuçları. *Arastırma Sonuçları Toplantısı* 21(2), 273-284.

Özsait, M. 2005. 2003 Yılı Amasya, Samsun ve Ordu illeri yüzey arastırmaları. *Arastırma Sonuçları Toplantısı* 22(2), 263-274.

Özsait, M. 2006. 2004 Yılı Samsun ve Amasya illeri yüzey arastırmaları. *Arastırma Sonuçları Toplantısı* 23(2), 249-258.

Özsait, M. 2007. 2005 yılı Tokat ili, Zile ve Turhal ilçeleri yüzey araştırması. *Arastırma Sonuçları Toplantısı 24 (2)*, 451-462.

Özsait, M. 2009. Yılı Amasya-Suluova yüzey arastırmaları. *Arastırma Sonuçları Toplantısı 26*(2), 373-390.

Özsait, M. and Özsait, N. 2001. Les sites archéologiques du IIe millénaire avant J.-C. à Tokat. In: Wilhelm, G., (ed.). *Akten des IV. Internationalen Kongresses für Hethitologie. Würzburg 4.-8. Oktober 1999*, 541-551. Studien zu den Boğazköy Texten 45. Wiesbaden: Harrassowitz.

Palmisano, A., 2012. Diachronic and Spatial Distribution of Khabur Ware in the Early Second Millennium BC. *Journal of Open Archaeology Data* 1:e8, DOI: http://dx.doi.org/10.5334/4f8d6ed49bd54

Palmisano, A., 2007. *Gli edifici templari nelle antiche capitali assire.* Unpublished MA thesis. Roma: Università di Roma “La Sapienza”.

Palmisano, A., 2013a. Zooming Patterns Among the Scales: a Statistics Technique to Detect Spatial Patterns Among Settlements. In: Earl, G., Sly, T., Chrysanthi, A., Murrieta-Flores, P., Papadopoulos, C., Romanowska, I., and Wheatley, D. (eds.), *Archaeology in the Digital Era. Papers from the 40th Annual Conference of Computer Applications and Quantitative Methods in Archaeology (CAA), Southampton, England, 26-29 March 2012.* Amsterdam: Amsterdam University Press, 348-356.

Palmisano, A., 2013b. Computational and Spatial Approaches to the Commercial Landscapes and Political Geography of the Old Assyrian Colony Period, in: L. Feliu, - J. Llop, A. Millet al.bà – J. Sanmartín, *Time and History in the Ancient Near East. Proceedings of the 56th Rencontre Assyriologique Internationale at Barcelona 26–30 July 2010.* Winona Lake: Eisenbrauns, 767 -783.

Palmisano, A., 2014. Geo-Politics and Trade in Central Anatolia in the Middle Bronze Age. In: Bielinski, P., Gawlikowski, M., Kolinski, R., Lawecka, D., and Soltysiak, A. (eds.), *Proceedings of the 8th International Congress on the Archaeology of the Ancient Near East, 30 April - 4 May 2012.* Wiesbaden: Harrassowitz-Verlag, 51-63.

Palmisano, A., *in press.* Geo-political Patterns and Connectivity in the Upper Khabur Valley in the Middle Bronze Age.

Parayre, D., 1987-1988. Tell Leilan 1987: Sceaux et empreintes de sceaux. *Les Annales Archeologiques Arabes Syriennes 37-38*, 128-141.

Parayre, D. 1990. Seals and Seal Impressions from Tell Leilan 1995. In: Weiss, H., Akkermans, P., Stein, G. J., Parayre, D., and Whiting, R., 1990. 1985, Excavations at Tell Leilan. *American Journal of Archaeology 94*, 556-567.

Parayre, D., 1993. Vers une definition de la culture des royaumes amorites de haute Mesopotamie: les particularites septentrionales de la glyptique de Tell Leilan a l'epoque Paleo-Babylonienne (ca. 1807-1728 av. J.C.). In: Mellink, M. J., Porada, E., and Ozguc, T., *Aspects of Art and Iconography: Anatolia and its Neighbors*. Ankara: Turk Tarih Kurumu Basimevi.

Parker, B., 1975. Cylinder Seals from Tell al Rimah. *Iraq 37*, 21-38

Parker, B. J., and Dodd, L. S., 2003. The early second millennium ceramic assemblage from Kenan Tepe, southeastern Turkey. A preliminary assessment. *Anatolian Studies 53*, 33-69.

Parker, B., and Cobb, P., 2012. Kenan Tepe: Digital Data and Media.Open Context. http://opencontext.org/projects/3DE4CD9C-259E-4C14-9B03-8B10454BA66E DOI:10.6078/M7H41PBJ

Parise, N., 1991. Dai pesi egei per la lana alla mina di Dudu. *Quaderni Ticinesi di Numismatica e Antichita’ Classiche 20,* 13-16.

Parise, N., 1994. Ricerche ponderali. *Annali dell’Istituto Italiano di Numismatica 38-41*, 13-21.

Parrot, A., 1959a. *Les Temples d’Ishtarat et de Ninni-Zaza. Mission Archeologique de Mari, vol. III*. Librairie Orientaliste Paul Gauthner, 273-275.

Parrot, A., 1959b. *Mission archéologique de Mari. V. II: le palais. Pt. 3: documents et monuments*. Paris: Librairie orientaliste P. Geuthner.

Parpola, S., A., and Brunswig, R. H., 1977. The Meluhha village. Evidence of Acculturation of Harappan Traders in Late Third Millennium Mesopotamia? *Journal of the Economic and Social History of the Orient 20* (2): 129-165.

Pauketat, T. R., 2007. *Chiefdoms and other archaeological delusions.* Lanham: Rowman and Littlefield Publishers.

Paynter, R.W., 1982. *Models of Spatial Inequality: Settlement Patternsin Historical Archaeology*. New York: Academic Press.

Peacock, D. P. S., 1982. *Pottery in the Roman World: An Ethnoarchaeological Approach*. New York: Longman.

Pearson, C. E., 1980. Rank-size distributions and the analysis of prehistoric settlement systems. *Journal of Anthropological Research* 36**,** 453–462.

Pearson, K., 1895. Notes on regression and inheritance in the case of two parents. *Proceedings of the Royal Society of London* 58, 240–242.

Pelletier, D., Clark, M., Anderson, M. G., Rayfield, B. and Wulder, M. A. and Cardille J. A., 2014. Applying Circuit Theory for Corridor Expansion and Management at Regional Scales: Tiling, Pinch Points, and Omnidirectional Connectivity. *PLoS ONE 9(1)*, e84135. doi:10.1371/journal.pone.0084135

Petruso, K. M., 1992. *Ayia Irini: The Balance Pan Weights. An Analysis of Weight Measurement in Prehistoric Crete and the Cycladic Islands (=Keos VIII).* Mainz: Philip von Zabern.

Pettinato, G., 1981. *The Archives of Ebla.* New York: Doubleday and Company.

Peyronel, L., 2006. Tell Tuqan. La Campagna del 1993: Area L Sud. In: Baffi, F. (ed.), *Tell Tuqan. Ricerche archeologiche nella regione del Maath*. Galatina: Congedo Editore, 176-231.

Pfalzner, P., 1995. *Mittanische und Mittelassyrische Keramik: eine chronologische, funktionale und produktionsokonomische Analyse. Berlin: Dietrich Reimer Verlag.*

Pfälzner, P., 2012. The question of Desurbanisation versus Reurbanisation of the Syrian Jazira in the Late Third andEarly Second Millennium BC. In: N. Laneri, P. Pfalzner & S. Valentini (eds.), *Looking North: The Socioeconomic Dynamics of the Northern Mesopotamian and Anatolian Regions during the Late Third and Early Second Millennium BC.* Harrassowitz Verlag: Wiesbaden 2012, 51-80.

Philip, G., Donoghue, D., Beck, A. and Galiatsatos, N., 2002. CORONA satellite photography: an archaeological application from the Middle East, *Antiquity 76*, 109–18.

Phillips, S. C., 2011. *Networked glass: lithic raw material consumption and social networks in the Kuril islands, Far Eastern Russia*. Unpublished PhD thesis, University of Washington, Seattle.

Pinto, N. and Keitt, T. H., 2009. Beyond the least-cost path: evaluating corridor redundancy using a graph-theoretic approach. *Landscape Ecology 24*, 253-266.

Plog, S., Plog, F., and Wait, W., 1978. Decision Making in Modern Surveys. In: M. B. Schiffer (ed.), *Advances in Archaeological Method and Theory.* New York: Academic Press, 384-421.

Plog, S. and Hantman, J. L., 1990. Chronology construction and the study of prehistoric culture change. *Journal of Field Archaeology* 17(4), 439–56.

Polanyi, K., Arensburg, C.M., Pearson, H.W., 1957. *Trade and Market in the Early Empires*. Chicago: Regnery.

Pollock, S., 1999. *Ancient Mesopotamia.* Cambridge: Cambridge University Press.

Porada, E., 1965. The Relative Chronology of Mesopotamia. Part I. Seals and Trade (6000-1600 BC). In: Ehrich, R. W. (ed.), *Chronologies in the Old World Archaeology*, 133-200. Chicago: University Chigaco Press.

Posluschny, A. G., Fischer, E., Rösch, M., Schatz, K., Stephan, E., and Stobbe, A., 2010. Modelling the Agricultural Potential of Early Iron Age Settlement Hinterland Areas in southern Germany. In: Kluiving, S. J. and Guttmann-Bond E. B. (eds.), *Landscape Archaeology between Art and Science. From a multi to an interdisciplinary approach. Landscape and Heritge Series, Proceedings.* Amsterdam, 413-428.

Postgate, J. N., 1973. Tell Taya tablets 1972-1973. *Iraq 35*, 173-175.

Postgate, J. N., 1992. *Early Mesopotamia. Society and Economy at the Dawn of History.* London and New York: Routledge.

Postgate, J. N., 2001. System and Style in Three Near Eastern Bureaucracies. In: Voutsaki, S., and Killen, J. (eds.), *Economy and Politics in the Mycenaean Palace States.* Cambridge: Cambridge Philological Society, 181-194.

Postgate, C., Oates, D. and Oates, J., 1997. The excavations at Tell al Rimah: the pottery. Warminster, England: Published for the British School of Archaeology in Iraq and the Directorate of Antiquities by Aris & Phillips Ltd.

Prag, K., 1970. The 1959 Deep Soundings at Harran in Turkey. *Levant 2,* 63-94.

Preusser, C., 1955. *Die Paläste in Assur.* Berlin: Gebr. Mann.

Premo, L. 2004. Local spatial autocorrelation statistics quantify multi-scale patterns in distributional data: an example from the Maya Lowlands. *Journal of Archaeological Science 31*, 855-866.

Pulak, C., 1998. Uluburum shipwrech: an overview. *The International Journal of Nautical Archaeology 27(3),* 188-224.

Pulhan, G., 2000. *On the Eve of the Dark Age: Qarni-Lim's Palace at Tell Leilan.* Phd unpublished thesis. Ann Arbor: UMI Dissertation Services, Bell & Howell Information and Learning, ProQuest Company.

Putterman, L., 2008. Agriculture, diffusion and development: Ripple effects of the Neolithic Revolution. *Economica 75*: 729-745.

Rahmstorf, L., 2006a. Zur Ausbreitung vorderasiatischer Innovationen in die frühbronzezeitliche Ägäis. *Prähistorische Zeitschrift 81*, 49-96.

Rahmstorf, L., 2006b. In search of the earliest balance weights, scales and weighing systems from the East Mediterranean, the Near and Middle East. In: Alberti, M. E., Ascalone, E., and Peyronel, L. (eds.), *Weights in Context. Bronze Age Weighing Systems of Eastern Mediterranean. Chronology, Typology, Material and Archaeological Contexts. Proceedings of the International Colloquium, Roma 22nd-24th November 2004.* Roma: Istituto Italiano di Numismatica, 9-45.

Rahmstorf, L., 2010. The concept of weighing during the Bronze Age in the Aegean, the Near East and Europe. In: Morley, I., and Renfrew, C. (eds.), *The Archaeology of Measurement.* Cambridge: Cambridge University Press, 88-105.

Rahmstorf, L., 2011. Re-integrating "Diffusion": the Spread of Innovations among the Neolithic and Bronze Age Societies of Europe and the Near East. In: T. Wilkinson, S. Sherratt and J. Bennet (eds.), *Interweaving worlds: sytemic interaction in Eurasia, 7th to 1st millennia BC*. Oxford: Oxbow, 100-19.

Ramsay, W., 1890. *The Historical Geography of Asia Minor*. London: John Murray.

Rappaport, R. A., 1971. Ritual, sanctity and cybernetics. *American Anthropologist 73*, 59-76.

Reade, J., 1968. Tell Taya (1967): Summary Report. *Iraq 30,* pp. 234-264.

Reade, J., 2005. The Ishtar Temple at Nineveh. *Iraq 67*, 347-390.

Redman, C. L., 1982. Archaeological survey and the study of Mesopotamian urban systems. *Journal of Field Archaeology* 9 (3), 375–82.

Renfrew, C., 1975. Trade as Action at a Distance: Questions of Integration and Communication. In: Sabloff, J. A., Lamberg-Karlowsky, C.C., (eds.), *Ancient Civilizations and Trade*. Albuquerque: University of New Mexico Press, 3-60.

Renfrew, C. and Level, E., 1979. Exploring Dominance: Predicting Polities from Centers. In: Renfrew C. and Cooke K. L. (eds.), *Transformations: Mathematical Approaches to Culture Change*, 145–166.

Renfrew, C., 1986. Introduction: peer polity interaction and socio-political change. In:

Renfrew, C., and Cherry, J. F., (eds.), *Peer Polity Interaction and Socio-Political Change.* Cambridge: Cambridge University Press, 1-18.

Renger, J., 1977. Legal Aspects of Sealing in Ancient Mesopotamia. In: Gibson, McG. And Biggs, R. D., (eds.), *Seals and sealing in the Ancient Near East.* Malibu: Undena, 75-88.

Renger, J., 1995. Institutional, Communal, and Individual Ownership or Possession of Arable Land in Ancient Mesopotamia from the End of the Fourth to the End of the First Millennium B.C. *Chicago-Kent Law Review* 71:269-319.

Rihill, T. E., and Wilson, A. G., 1987. Model-based approaches to the analysis of regional settlement structures: the case of ancient Greece. In: P. Denley and D. Hopkin (Eds.), *History and computing*, 10-20.

Riis, P. J., and Buhl, M. L., 2007. *Hama. Fouilles et Recherches de la Fondation Carlsberg, 1931-938.* Copenhagen: Nationalmuseet.

Ristvet, L., 2005. *Settlement, economy, and society in the Tell Leilan Region, Syria, 3000–1000 BC*. Unpublished dissertation, University of Cambridge.

Ristvet, L., 2008. Legal and archaeological territories of the second millennium BC in northern Mesopotamia. *Antiquity* 82 (317), 585–99.

Ristvet, L., 2012. Resettling Apum: Tribalism and Tribal States in the Tell Leilan Region, Syria. In: A. Bianchi, N. Laneri, and S. Valentini (eds.), *Looking North: The socioeconomic dynamics of the northern Mesopotamian and Anatolian regions during the late third and early second millennium BC.* Wiesbaden: Harrasowitz, 37-50.

Ristvet, L., and Weiss, H., 2005. The Hābūr Region in the Late Third and Early Second Millennium B.C. In: W. Orthmann (ed.), *The History and Archaeology of Syria*. Vol. 1. Saabrucken: Saarbrucken Verlag.

Ristvet, L., and Weiss, H., 2013. The Habur Region in the Old Babylonian Period. In: W. Orthmann, P. Matthiae, and M. al-Maqdissi (eds.), *Archéologie et Histoire de la Syrie*. Wiesbaden: Harrassowitz, 257-272.

Rivers, R., Knappet, C., and Evans, T., 2013. Network Models and Archaeological Spaces. In: Bevan, A. and Lake, M. (eds.), *Computational Approaches to Archaeological Spaces.* Walnut Creek: Left Coast Press, 99 – 126.

Roaf, M., 2004. *Cultural Atlas of Mesopotamia and the ancient Near East.* New York: Facts on File.

Robert, C. P. and Casella, G., 2004. *Monte Carlo Statistical Methods.* New York: Sprinter-Verlag.

Roberts, N., Reed, J., Leng, M.J., Kuzucuoglu, C., Fontugne, M., Bertaux, J., et al. (2001). The tempo ofHolocene climatic change in the eastern Mediterranean region: New high-resolution crater-lake sediment data from central Turkey. *The Holocene* 11, 719–734.

Rollig, W. And Kuhne, H., 1978. A preliminary report on a survey conducted by the Tubinger Atlas des Vorderen Orients. *Les Annales Archeologiques Arabes Syriennes 27-28,* 115-140.

Roper, D. C., 1976. Lateral Displacement of Artefacts Due to Plowing. *American Antiquity 41*, 372-375.

Rosen, A. M., 1986. *Cities of Clay: The Geoarchaeology of Tells*. Chicago: University of Chicago Press.

Roth, M., 1997. *Law collections from Mesopotamia and Asia Minor.* Atlanta: Society of Biblical literature.

Rothman, M., 2001. *Uruk Mesopotamia and Its Neighbors: Cross Cultural Interactions in the Era of State Formation.* Santa Fe: School of American Research Press.

Rouault, O., 1977. L'Approvisionnement et la Circulation de la Laine à Mari d'après une Nouvelle Lettre du Roi à Mukannilum. *Iraq 39*, 147-153.

Rouault, O., 1984. *Terqa Final Reports 1. L'archive de Puzurum. Bimes 16.* Malibu: Undena.

Rouault, O., 1992. Cultures locales et influences exterieures: le cas de Terqa. *SMEA 30*, 247-256.

Rowlands, M., 1998. Centre and periphery: a review of a concept. In: Kristiansen, K. and Rowlands, M. (eds), *Social Transformations in Archaeology.* London: Routledge.

Sagona, A. and Zimansky. P., 2009. *Ancient Turkey.* London: Routledge.

Sahlins, M. ,1972. *Stone-Age Economics*. Chicago: Aldine.

Şahoğlu, V. 2004. Interregional Contacts Around the Aegean During The Early Bronze Age: New Evidence from the Izmir Region. *Anatolia* 27,97-120.

Salvini, M., 1998. Kahat nella documentazione cuneiforme. Repertorio delle fonti. In: Pecorella, P. E., (ed.), *Tell Barri/Kahat 2.* Roma: Istituto per gli studi Micenei ed Egeo-Anatolici, 29-34.

Sanders, W. T., 1956. The Central Mexican Symbiotic Region: A study in Prehistoric Settlement Patterns. In: Wiley, G. R. (ed.), *Prehistoric Settlement Patterns in the New World.* New York: Wenner-Gren Foundation, 115-127.

Sanderson, S., 1995. *Social Transformations.* Oxford: Blackwell.

Sanderson, S., 1999. *Social Transformations: A general theory of historical development.* Lanham: Rowman & Littlefield.

Sanlaville, P., 1985. *Holocene Settlement in North Syria.* Oxford: BAR International Series 1.

Sauer, C., 1925. The morphology of landscapes. *University of California Publications in Geography 2:* 19-14

Savage, S. H., 1997. Assessing Departures from Log-Normality in the Rank-Size Rule. *Journal of Archaeological Science 24*, 233–244.

Sayre, E.V., K.A. Yener & E.C. Joel 1995. Comments on 'Oxhide ingots, recycling, and the Mediterranean metals trade'. *Journal of Meditrranean Archaeology 8*, 45-53.

Schachner, A., and Schachner, S., 1995. Eine "syrische" Flasche aus Fara. *Mitt. Dt. Orient-Ges. 127,* 83–96.

Schaeffer, C. F. A., 1974. Le cylindre A 357 de Chagar Bazar. *Iraq 36*, 223-228.

Schaeffer-Forrer, C. F. A., 1983. *Corpus des cylindres-sceaux de Ras Shamra-Ugarit et d'Enkomi Alasia.* Paris: Editions Recherche sur les civilisations.

Scheidel, W., 2013. Studying the State. In: Bang, P. F., and Scheidel, W., (eds.), *The Oxford Handbook of the State in the Ancient Near East and Mediterranean.* Oxford: Oxford University Press: 5-57.

Schiffer, M. B., 1987. *Formation Processes of the Archaeological Record.* Albuquerque: University of New Mexico Press.

Schiffer, M. B., A. P. Sullivan and T. C. Klinger, 1978. The Design of Archaeological Surveys. *World Archaeology* 10, 1-28.

Schmidt, C., 2012. The Late Third and Early Second Millennium BC Pottery Tradition in the Syrian Jazira and Beyond. In: N. Laneri, P. Pfalzner & S. Valentini (eds.), *Looking North: The Socioeconomic Dynamics of the Northern Mesopotamian and Anatolian Regions during the Late Third and Early Second Millennium BC.* Harrassowitz Verlag: Wiesbaden 2012, 163-174.

Schmidt, C., 2013. *Die Keramik der Früh-Ğazira V- bis Alt-Ğazira II-Zeit.* Wiesbaden: Harrassowitz.

Schmidt, K., 2002. *Norşuntepe. Kleinfunde II*. Mainz: Verlag Philip von Zabern.

Schneider, A., 1920. *Die sumerische Tempelstadt.* Essen.

Schoop, U. D., 2003. Pottery traditions of the later Hittite Empire: problems of definition. In: B. Fischer, H. Genz, É. Jean and K. Köroğlu (eds.), *Identifying changes: The transition from Bronze to Iron Ages in Anatolia and its neighbouring regions. Proceedings of the international workshop Istanbul, November 8-9, 2002* Istanbul: Ege Yayınları, 167–178.

Schoop, U. D., 2006. Dating the Hittites with Statistics: Ten Pottery Assemblages from Boğazköy-Hattuša. In: D. P. Mielke, U. D. Schoop and J. Seeher (eds.), *Strukturierung und Datierung in der hethitischen Archäologie. Voraussetzungen – Probleme – Neue Ansätze. Structuring and Dating in Hittite Archaeology. Requirements – Problems – New Approaches. Byzas 4*. Istanbul: Ege Yayınları, 215–239.

Schoop, U. D., 2009. Indications of structural change in the Hittite pottery inventory at Boğazköy-Hattuša. In: F. Pecchioli Daddi, G. Torri and C. Corti (eds.), *Central-North Anatolia in the Hittite Period. New Perspectives in Light of Recent Research. Acts of the International Conference held at the University of Florence (7–9 February 2007). Studia Asiana 5.* Rome: Herder, 145–167.

Schwartz, G., 2012. From Urban Origins to Imperial Integration In Western Syria: Umm el-Marra 2006, 2008. *American Journal of Archaeology 116*, 157-193.

Schwartz, G., 2013. An Amorite Global Village: Syrian=Mesopotamian Relations in the Second Millennium B.C. In: Aruz, J., Graff, S. B., and Rakic, Y. (eds.), *Cultures in Contact. From Mesopotamia to the Mediterranean in the Second Millennium B.C.* New York: The Metropolitan Museum of Art, 2-11.

Senyurt, S.Y. 1999. Nevsehir Ili 1997 yılı yuzey arastırması. *Arastırma Sonuçları Toplantısı* 16(1), 451-466.

Service, E. R., 1975. *Origins of the state and civilization.* New York: W. W. Norton.

Seton-Williams, M. V., 1954. Cilician Survey. *Anatolian Studies 4,* 121-174.

Sever, H., 1990. Yeni Kültepe tabletlerinde geçen "kima awāt naruâ'im tabiri ve değerlendirilmesi. *Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi Dergisi 34,* 251-265.

Sevin, M., 1984. Imakuşaği Kazÿlarÿ 1984. *Kazi Sonuçlari Toplantisi 6,* 93-102.

Sevin, M., 1987. Imakuşaği Kazÿlarÿ 1986. *Kazi Sonuçlari Toplantisi 9,* 299-333.

Sevin, V. and Köroğlu, K., 1985. Imakuşaği Kazÿlarÿ 1984. *Kazi Sonuçlari Toplantisi 7*, 163-179.

Shah, B. V. and McRae, B. H., 2008. A Tool for Landscape Ecology. In: G. Varoquaux, T. Vaught, J. Millman (eds.), *Proceedings of the 7th Python in Science Conferenc (SciPy 2008),* 62-66.

Shennan, S. J., 1989. *Archaeological approaches to cultural identity.* London: Unwin Hyman, 1-32.

Shennan, S., J., 1997. *Quantifying Archaeology.* Edinburgh: Edinburgh University Press.

Sherratt, E. S., 1999. E Pur Si Muove: Pots, Markets and Values in the Second Millennium Mediterranean. In: Crielaard J. P., Stissi, V., and van Wijngaarden, G. J. (eds.), *The Complex Past of Pottery: Production, Circulation and Consumption of Mycenean and Greek Pottery (Sixteenth to Early Fifth Centuries BC).* Amsterdam: Gieben, 163-209.

Sherratt, A. G., and Sherratt, E. S., 1991. From Luxuries to Commodities: The Nature of Bronze Age Trading Systems. In: Gale, N. (ed.), *Bronze Age Trade in the Mediterranean*. Amsterdam: Gieben, 163-209.

Sherratt, A., and Sherratt, S., 2001. Technological Change in the East Mediterranean Bronze Age: Capital, Resources and Marketing. In: Shortland, A. J. (ed.), *The Social Context of Technological Change: Egypt and the Near East 1650-1550 BC.* Oxford: Oxbow, 15-38.

Sindbæk, S. M., 2007. Networks and nodal points: the emergence of towns in Early Viking Age candinavia. *Antiquity 81*(311), 119–132.

Silva, M. D. and Pizziolo, G., 2001. Setting up a `human calibrated' anisotropic cost surface for archaeological landscape investigation. In: Stancic, Z. and Veljanovski, T. (eds), *Computing Archaeology for Understanding the Past. Proceedings of the CAA2000 Conference,* number 931. British Archaeological Reports International Series, 279-286. Oxford: Archaeopress.

Silver, M., 1995. *Economic Structures of Antiquity.* London: Greenwood Press.

Silver, M., 2004. Modern ancients. In: Rollinger, R., and Ulf, C., (eds.), *Commerce and Monetary Systems in the Ancient World. Means of Transmission and Cultural Interaction. Proceedings of the Fifth Annual Symposium of the Assyrian and Babylonian Intellectual Heritage Project. Held in Innsbruck, Austria, October 3rd-8th, 2002.* Stuttgart: Franz Steiner Verlag, 65-87.

Sipahi, T. and Yildirim, T., 1998. 1996 Yili Çorum bölgesi yüzey arastirmalari. *Arastırma Sonuçları Toplantısı* 15 (2), 19-39.

Sipahi, T. and Yıldırım, T. 1999. 1997 Yılı Çorum bölgesi yüzey arastırmaları. *Arastırma Sonuçları Toplantısı* 16(1), 433-450.

Sipahi, T. and Yıldırım, T. 2000. 1999 Yılı Çorum bölgesi yuzey arastırması. *Arastırma Sonuçları Toplantısı* 17(2), 31-40.

Sipahi, T. and Yıldırım, T. 2004. 2002 Yılı Çorum ve Çankiri illeri yüzey arastırması. *Arastırma Sonuçları Toplantısı* 21(2), 305-313.

Sipahi, T. and Yıldırım, T. 2008. 2006 Yılı Çorum-Çankiri illeri yüzey arastırması. *Arastırma Sonuçları Toplantısı* 25(2), 277-294.

Slotsky, A., and Wallenfels, R., 2009. *Tallies and trends: the late Babylonian commodity price lists*. Bethesda, Md: CDL Press.

Smith, A., 2003. *The political landscape.* Berkley and Los Angeles: University of California Press.

Smith, M. E., 2004. The archaeology of ancient states economies. *Annual Review of Anthroplogy 33*: 72-103.

Smith, A. 2005. *Climate, culture, agriculture: examining change in the Near East during the Bronze and Iron Ages.* Boston University, Unpublished PhD Dissertation.

Snell, D. C., 1977. The activities of some merchants of Umma. *Iraq 39*: 45-50.

Spanos, P. Z., 1988. Ausgrabungen in Tall Durdara (Eski Mosul Project) und Tall Hamad Aga as-Saghir (Jazira Project), Nordirak, 1986. *Mitteilungen der Deutschen Orient-Gesellschaft 120,* pp. 59-92.

Spanos, P. Z., 1990. Ausgrabungen in Tall Hamad Aga as-Sagir 1998. *Mitteilungen der Deutschen Orient-Gesellschaft 122,* 89-123.

Speiser, E. A., 1933. The Pottery of Tell Billa. *The Museum Journal 23,* pp.249-308.

Speiser, E. A., 1935. *Excavations at Tepe Gawra.* Philadelphia: University of Pennsylvania Press.

Stančič, Z., Dular, J., Gaffney, V. and Tecco-Hvala, S., 1994. A GIS-based analysis of Later Prehistoric settlement patterns in Dolenjska, Slovenia. In: J. Wilcock J. and Lockyear K. (eds.), *Computer Applications and Quantitative Methods in Archaeology 1993. BAR International Series598 (Oxford 1994),* 161–164.

Stančič, Z., Gaffney, V., Ostir-Sedej, K. and Podobnikar, T., 1997. Gis analysis of land-use, settlement patterns and territories on the island of Brac. In: Johnson, I., and North, M. (eds.), *Archaeological Applications of GIS: Proceedings of Colloquium II, UISPP XIIIth Congress,* Forlí, Italy. Sydney: Archaeological Computing Laboratory. CD-ROM.

Starr, R. F. S., 1937. *Nuzi. Report on the Excavations at Yorgan Tepe near Kirjuk, Iraq.* Cambridge, Massachusetts: Harvard University Press.

Stech, T., and Pigott, V., 1986. The Metals Trade in Southwest Asia in the Third Millennium BC. *Iraq 48*: 39-64.

Stefanakis, E. and Kavouras, M., 1995. On the Determination of the Optimum Path in Space. *Lecture Notes in Computer Science* 988, 241-257.

Stein, A., 1940. *Old Routes of Western Iran. Narrative of an Archaeological Journey Carried Out and Recorded.* London: McMillan and Company Ltd.

Stein, D. L., 1984. Khabur Ware and Nuzi Ware: Their Origin, Relationship, and Significance. *Assur 4/1,* 1-65.

Stein, D. L., 1994. The Seal Impressions. In: Wilhelm, G. (ed.), *Das Archiv des Šilwa-Teššup 8-9.* Wiesbaden: Harrassowitz Verlag.

Stein, G. J., 2005. The Political Economy of Mesopotamian Colonial Encounters. In: Stein, G. J., (ed.), *The Archaeology of Colonial Encounters.* Santa Fe: School of American Research, 143-172.

Stein, G. J., 2008. A theoretical model for political economy and social identity in the Old Assyrian colonies of Anatolia. *TUBA-AR* 11: 25-40.

Steinkeller, P., 1977. Seal Practice in the Ur III Period. In: Gibson, McG. And Biggs, R. D., (eds.), *Seals and sealing in the Ancient Near East.* Malibu: Undena, 41-53.

Steinkeller, P. 1996. The Organization of Crafts in Third Millennium Babylonia: The Case of the Potters." *Altorientalische Forschungen* 23:232-53.

Steinmetz, G., 1999. Introduction: Culture and the state. In: Steinmetz, G., (ed.), *State/culture: State formation after the cultural turn.* Ithaca, NY: Cornell University Press.

Steward, J., 1972. *Theory of Culture Change.* Urbana: University of Illinois Press.

Stoddart, S., 2000. *Landscapes from Antiquity.* Cambridge: Antiquity Publications.

Stoddart, S., and Zubrow, E., 1999. Changing places. *Antiquity 73:* 686-88.

Stratford, E., 2014. "Make Them Pay": Charting the Social Topography of an Old Assyrian Caravan Cycle. *Journal of Cuneiform Studies* 66, 11-38.

Strommenger, E., 1991. Ausgrabungen in Tall Bi'a 1990. *Mitteilungen der Deutschen Orient-Gesellschaft 123,* 7-34.

Strommenger, E., and Kohlmeyer, K., 1998. *Tall Bi'a/Tuttul – I. Die altorientalischen Bestattungen.* Wiesbaden: Harrassowitz Verlag.

Süel, A. 1990. 1988 Yılı Çorum ili yüzey arastırmaları. *Arastırma Sonuçları Toplantısı* 7, 341-359.

Summer, W. M., 1990. Full-Coverage Regional Archaeological Survey in the Near East: An Example from Iran. In: S. K. Fish and S. A. Kowalewski (eds.), *The Archaeology of Regions*. Washington D.C. and London: Smithsonian Institution Press, 87-113.

Tainter, J., 1988. *The Collapse of Compex Societies.* Cambridge: Cambridge University Press.

Talon, P., 1997. *Old Babylonian Texts from Chagar Bazar* (Akkadica Supplementa 10). Brussels: FAGD·ASGD.

Teissier, B., 1984. *Ancient Near Eastern cylinder seals from the Marcopolic collection.* Berkeley : University of California Press.

Teissier, B., 1994. *Sealing and seals on texts from Kültepe Kārum level 2.* Leiden: Nederlands Historisch-Archaeologisch Instituute Istanbul.

Temin, P. 2001. A market economy in the early Roman Empire. *Journal of Roman Studies 91*,169–81.

Thomas, J. 1995. *Time, Culture and Identity: An Interpretive Archaeology*. London: Routledge.

Thünen, J. H. V., 1826. *Der isolirte Staat in Beziehung auf Landwirthschaftund Nationalökonomie, oder Untersuchungen über den Einfluss, den die Getreidepreise, der Reichtum des Bodens und die Abgaben auf den Ackerbau ausüben*,Berlin.

Tilley, C. 1994. *A Phenomenology of Landscape. Paths, Places and Monuments*. Oxford: Berg.

Topçuoğlu, O., 2014. Behind the Scenes: Seal Carvers as Artists and Artisans in The Old Assyrian Period. In: L. Atici, F. Kulakoğlu, G. Barjamovic, and A. Fairbairn (eds.), *Current Research at Kültepe-Kanesh (JCSSup 4).* Atlanta: Lockwood Press, 123-134.

Tosi, M., 1984. The notion of craft specialization and its representation in the archaeological record of early states. In: Spriggs, M. (ed.), *Marxist Perspectives in Archaeology.* Cambridge: Cambridge University Press, 22-52.

Trigger, B., 1972. Determinants of Urban Growth in Pre-Industrial Societies. In: Ucko, P. J., R. Tringham, R., and Dimbleby, G.W., (eds.), *Man, Settlement and Urbanism*. London: Duckworth and Co. Ltd, 575-599.

Trigger, B., 1993. *Early Civilizations: Ancient Egypt in Context.* Cairo: The American University in Cairo Press.

Trigger, B., 2003. *Understanding early civilizations: A comparative study.* Cambridge: Cambridge University Press.

Tunca, O., 1993. Des Inscriptions de sceaux-cylinders diverses provenantt d'Acemhoyuk. In: Mellink, M. J., Porada, E. and Ozguc, T. (eds.), A*spects of Art and Iconography: Anatolia and its Neighbors. Studies in honor of Nimet Ozguc*. Ankara: Turk Tarih Kurumu Basimevi, 629-637.

Tunca, Ö, and Lacambre, D., 2002. Note prèlimiinaire sur les nouvelles découvertes épigraphiques de Chagar Bazar. In: Charpin,D., and Durand, J. M., (eds.), *Florilegium marianum VI* . Paris: Sepoa, 545-6

Thünen, J. H. V., 1826. *Der isolirte Staat in Beziehung auf Landwirthschaftund Nationalökonomie, oder Untersuchungen über den Einfluss, den die Getreidepreise, der Reichtum des Bodens und die Abgaben auf den Ackerbau ausüben*,Berlin.

UNESCO, 2005. Operational Guidelines for the Implementation of the World Heritage Convention. Paris: UNESCO World Heritage Centre, 84.

UNESCO, 2012. Operational Guidelines for the Implementation of the World Heritage Convention. Paris: UNESCO World Heritage Centre, 14.

Unger, E., 1918. *Katalog der babylonischen und assyrischen Sammlung. III, 1. Gewichte und gewichtsähnliche Stücke.* Kostantinopel.

Ur, J. A., 2003. CORONA satellite photography and ancient road networks: a northern Mesopotamian case study. *Antiquity* 77 (295), 102–15.

Ur, J. A., 2004. *Urbanism and Society in the Third Millennium Upper Khabur Basin.* Unpublished PHD dissertation. Chicago University.

Ur, J. A., 2009. Emergent landscapes of movement in Early Bronze Age northern Mesopotamia. In: Snead, J.E., Erickson, C. and Darling, W.A. (Eds.), *Landscapes of Movement: Paths, Trails, and Roads in Anthropological Perspective*. Philadelphia: University of Pennsylvania Museum Press, 180–203.

Ur, J. A., 2010a. Cycles of Civilization in Northern Mesopotamia, 4400–2000 BC. *Journal of Archaeological Research 18*, 387-431.

Ur, J. A., 2010b. *Urbanism and Cultural Landscapes in Northeastern Syria: The Tell Hamoukar Survey, 1999-2001*. Oriental Institute Publications 137. Chicago: University of Chicago Oriental Institute.

Ur, J. A. 2013. CORONA Satellite Imagery and Ancient Near Eastern Landscapes. In: D. C. Comer and M. J. Harrower (eds.), *Mapping Archaeological Landscapes from Space*. New York: Springer, 19-29

Ur, J. A., Karsgaard, P., and Oates, J., 2007. Urban Development in the Ancient Near East. *Science 317*, 1188.

Ur, J. A., and Wilkinson, T. J., 2008. Settlement and Economic Landscapes of Tell Beydar and its Hinterland. In: M. Lebeau and A. Suleiman (eds.), *Beydar Studies I*. Turnhout: Brepols, 305-327.

Uzunoğlu, E., 1986. Malatya Imamoğlu Höyüğünde 1985 yili kazi calismar. *Kazi Sonuclari Toplantisi 8.*

Van De Mieroop, M., 2007. *A History of the Ancient Near East.* Oxford: Blackwell Publishing.

Van Driel, G., 1969. *The Cult of Asshur.* Assen: van Gorcum.

Veenhof, K. R., 1972. *Aspects of Old Assyrian Trade and its Terminology.* Leiden: Brill.

Veenhof, K. R., 1977. Some social effects of Old Assyrian Trade. *Iraq 39*, 109-118.

Veenhof, K. R., 1987. Review of L. Matouš and M. Matoušová-Rajimová KKS 1984. *Orientalische Literaturzeitung 82/4,* 350-356.

Veenhof, K. R., 1988. Prices and Trade. The Old Assyrian Evidence. *Altorientalische Forschungen 15,* 243-263.

Veenhof, K., R., 1993. On the identification and implications of some bullae from Acemhöyük and Kültepe. *Studies N. Özgüç 124,* 645-657.

Veenhof, K. R., 1995a. Kanesh: An Assyrian Colony in Anatolia. In: Sasson, J. (ed.), *Civilizations of the Ancient Near East.* New York: Simon & Schuster MacMillan, 859-872.

Veenhof, K. R., 1995b. “In Accordance with the Words of the Stele” Evidence for Old Assyrian Legislation. *Chicago-Kent Law Review 70,* 181-184.

Veenhof, K. R., 1997. “Modern” features in Old Assyrian Trade. *Jesho 40*, 336-366.

Veenhof, K. R., 2003a. *The Old Assyrian list of year eponyms from karum Kanish and its chronological implications.* Ankara: Printed at Turkish Historical Society.

Veenhof, K. R., 2003b. Trade and politics in ancient Assur. Balacing of public, colonial and entrepreneurial interests. In: Zaccagini, C. (ed.), *Mercanti e politica nel mondo antico*. Roma: “L’Erma” di Bretschneider, 69-118.

Veenhof, K. R., 2008a. Veenhof, K. R., Across the Euphrates. In: Dercksen, J. G. (ed.), *Anatolia and the Jazira during the Old Assyrian period.* Leiden: The Netherlands Institute for the Near East.

Veenhof, K. R., 2008b. The Old Assyrian Period. In: Wäfler, M. (ed.), *Annäherungen 5*. Orbis Biblicus et Orientalis 160/5, part I. Fribourg: Academic Press Fribourg, 13-264.

Veenhof, K. R. and Eidem, J., 2008c. *Mesopotamia, The Old Assyrian Period.* Fribourg: Academic Press Fribourg.

Verhagen, P., Brughmans, T., Nuninger, L., and Bertoncello, F., 2013. The Long and Winding Road: Combining Least Cost Paths and Network Analysis Techniques for Settlement Location Analysis and Predictive Modelling. In: Earl, G., Sly, T., Chrysanthi, A., Murrieta-Flores, P., Papadopoulos, C., Romanowska, I., and Wheatley, D. (eds.), *Archaeology in the Digital Era. Papers from the 40th Annual Conference of Computer Applications and Quantitative Methods in Archaeology (CAA), Southampton, England, 26-29 March 2012.* Amsterdam: Amsterdam University Press, 357-366.

Villard, P., 1986. Un roi de Mari à Ugarit. *Ugarit-Forschungen 18*, 387-412.

Villard, P., 1995. Shamshi-Adad and Sons: The Rise and Fall of an Upper Mesopotamian Empire. In: Sasson, J. (ed.), *Civilizations of the Ancient Near East*. New York: Simon & Schuster MacMillan, 873-883.

de Vries-Melein, M., Visser, D., Mulder, J. J., Megens, L., Imberti, S., Kockelmann, W., Kars, H., 2010. Mesopotamian "Heamatite" seals in a new light. In: Matthiae, P., Pinnock, F., Nigro, L., Marchetti, N. (eds.), *Proceedings if the 6th International Congress on the Archaeology of the Ancient Near East. May, 5th-10th 2008, "Sapienza"- Universita' di Roma.* Wiesbaden: Harrassowitz Verlag, vol. 1, 219-231.

Wallerstein, I, 1974. *The Modern World-System I: Capitalist Agriculture and the Origins of the European World-Economy in the Sixteenth Century.* New York: Academic Press.

Wandsnider, L., 1998. Regional Scale Processes and Archaeological Landscape Units. In: A. F. Ramenofsky and A. Steffen (eds.), *Unit Isues in Archaeology: Measuring Time, Space, and Material*. Utah: University of Utah Press, 87–102.

Warburton, D., 2011. What might the Bronze Age World-System Look Like? In: T. C. Wilkinson, S. Sherratt and J. Bennet (eds.), *Interweaving worlds.* Oxford: Oxbow, 120-134.

Wattenmaker, P., 2009. States and Landscapes in Upper Mesopotamia. In: Falconer, S.E., and Redman, C. L., (eds.), *Polities and Power. Archaeological Perspectives on the Landscape of Early States.* Tucson: The University of Arizona Press.

Weber, A., 1909. *Über den Standort der Industrie: Reine Theoriedes Standorts*,Tübingen.

Weber, M, 1978. *Economy and Society: An outline of interpretative sociology.* Berkley, CA: University of California Press.

Weiss, H., 1985. Tell Leilan on the Habur Plains of Syria. *Biblical Archaeologist 48*, pp. 6-34.

Weiss, H., 2002. Beyond the Younger Dryas. Collapse as Adaption to Abrupt Climate Change in Ancient West Asia and the Eastern Mediterranean. In: Bawden, G., and Reycraft, R. (eds.), *Environmental Disaster and the Archaeology of Human Response.* Albunquerque: Maxwell Museum of Anthropology, 75-98.

Weiss, H., Courty, M.-A., Wetterstrom, W., Guichard, F., Senior, L., Meadow, R., and Curnow, A., 1993. The genesis and collapse of third millenium north Mesopotamian civilization. *Science 261*, 995–1003.

Welker, M., 1948. The Painted Pottery of the Near East in the Second Millennium BC and its chronological background. *Transactions of the American Philosophical Society 38,* 185-246.

Wheatley, D.,1993. Going over old ground: GIS, archaeological theory and the act of perception. In: Andresen, J., Madsen, T., and Scollar, I. (eds), *Computing the Past: Computer Applications and Quantitative Methods in Archaeology 1992,* 133-138. Aarhus: Aarhus University Press.

Wheatley, D., Garcia Sanjuan, L., Murrieta-Flores, P., and Marquez Perez, J., 2010. The magalithic phenomenon in Southern Spain: Approaching the Landscape dimension. *Oxford Journal of Archaeology 29 (4),* 387-405.

Wilhelm, G. and Zaccagnini, C., 1993. *Tell Karrana 3, Tell Jikan, Tell Khirbet Salih.* Mainz: Verlag Philipp Von Zabern.

Whitelaw, T., 2001. Reading between the Tablets: Assessing Mycenaean Palatial Involvement in Ceramic Production and Consumption. In: Voutsaki, S., and Killen, J. (eds.), *Economy and Politics in the Mycenaean Palace States*. Camridge: Cambridge Philological Society, 51-80.

Wick, L., Lemcke, G. and Sturm, M., 2003. Evidence of Late Glacial and Holocene climatic change and human impact in Eastern Anatolia: high-resolution pollen, charcoal, isotopic and geochemical records from the laminated sediments of Lake Van, Turkey. *Holocene 13 (5)*, 665–675.

Widell, M., 2008. The Ur III metal loans from Ur. In: Garfinkle, S. J., and Johnson, J. C. (eds.), *The Growth of an Early State in Mesopotamia: Studies in Ur III Administration*. *Proceedings of the First and Second Ur III Worshops at the 49th and 51st Rencontre Assyriologique Internationale, London July 10, 2003 and Chicago July 19, 2005*. Madrid: Consejo Superior de Investigaciones Científicas, 207-223.

Wilk, R. R., 1996. *Economies and Cultures:Foundations of Economic Anthropology*. Boulder, CO: Westview.

Wilk R. R. 1998. Comment on “The distributional approach: a new way to identify marketplace exchange in the archaeological record.” *Current Anthropology 39*, 469.

Wilkinson, T. J., 1990a. *Town and country in Southeastern Anatolia*. Chicago: University of Chicago Press.

Wilkinson, T. J., 1990b. The development of settlement in the North Jazira between the 7th and 1st Millennia BC. *Iraq 52*, 49-62.

Wilkinson, T. J., 1993. Linear hollows in the Jazira, upper Mesopotamia. *Antiquity 67*, 548–562.

Wilkinson, T. J., 1994. The structure and dynamics of dry farming states in Upper Mesopotamia. *Current Anthropology 35 (I)*: 483-520.

Wilkinson, T. J., 1997. Archaeological Survey of The Tell Beydar Region. Syria, 1997, a preliminary report. In: Van Lerberghe, K., and Voet, G. (eds.), *Tell Beydar, Environmental and Technical Studies. Subartu VI.* Turnhout: Brepols.

Wilkinson, T., J., 2000. Regional approaches to Mesopotamian archaeology: The contribution of archaeological surveys. *Journal of Archaeological Research* 8(3), 219–67.

Wilkinson, T. J., 2002. Physical and Cultural Landscapes of the Hamoukar Area. *Akkadica 123*, 89-105.

Wilkinson, T. J., 2003. *Archaeological Landscapes of the Near East*. Tucson: University of Arizona Press.

Wilkinson, T. J. and Tucker, D. J., 1995. *Settlement development in the North Jazira, Iraq: a study of the archaeological landscape*. Iraq Archaeological Reports, 3. Warminster: Aris & Phillips.

Wilkinson, T.J., French, C. A. I., Matthews, W. and, Oates, J., 2001. *Geoarchaeology, Landscape and the Region.* In: D. Oates, J. Oates and H. McDonald (eds.), *Excavations at Tell Brak, Vol. 2: Nagar in the Third Millennium BC*. Cambridge and London: McDonald Institute for Archaeological Research and the British School of Archaeology in Iraq, 1-14.

Wilkinson, T., J., Wilkinson, E. B., Ur, J. A., and Altaweel, M., 2005. Landscape and Settlement in the Neo-Assyrian Empire. *Bulletin of the American Schools of Oriental Research 340,* 23-56.

Wilkinson, T. J., French, C., Ur, J. A., Semple, M., 2010. The Geoarchaeology of Route Systems in Northern Syria. *Geoarchaeology 25 (6)*, 745–771

Williams, J. T. ,1993. Spatial autocorrelation and theClassic Maya collapse: one technique, one conclusion. *Journal of Archaeological Science 20*, 705-709.

Wilson, A. G., 1967. Statistical theory of spatial distribution models. *Transportation Research 1,* 253-269.

Wilson, A. G., 1970. *Entropy in Urban and Regional Modelling*. London: Pion Ltd.

Wilson, A. G., 2008. Boltzmann, Lotka and Volterra and spatial structural evolution: an integrated methodology for some dynamical systems. *Journal of the Royal Society Interface 5, 865-871.*

Wilson, A. G., 2010. Entropy in urban and regional modelling: retrospect and prospect. *Geographical Analysis 42*, 364-394.

Wilson, A. G., 2012a. The Science of Cities and Regions: Lectures on Mathematical Model Design. London: Springer.

Wilson, A. G., 2012b. Geographic modeling for archaeology and history: two case studies. *Advances in Complex Systems* 15 (1 – 2).

Wolley, L., 1955. *Alalakh. An Account of the Excavations at Tell Atchana in the Hatay, 1937-1949*. London: the Society of Antiquaries.

Wossink, A., 2009. *Challenging Climate Change. Competition and cooperation among pastoralists and agriculturalists in northern Mesopotamia (c. 3000-1600 BC).* Leiden: Sidestone Press.

Wright, H. T., 1978. Toward an Explanation of the Origin of the State. In: Cohen, R., and Service, E. R., (eds.), *Origins of the State: The Anthropology of Political Evolution.* Philadelphia: Institute for the Study of Human Issues, 49-68.

Wright, H. T., Rupley, E. S. A., Ur, J., Oates, J., and Ganem, E., 2006-2007. Preliminary Report on the 2002 and 2003 Seasons of the Tell Brak Sustaining Area Survey. *Les Annales Archéologiques Arabes Syrienne 49-50,* 7-21.

Yakar, J., 1981. The Indo-Europeans and Their Impact on Anatolian Cultural Development *Journal of Indoeuropean Studies* 9:94-112.

Yakar, J., 2000. *Ethnoarchaeology of Anatolia. Rural Socio-Economy in the Bronze and Iron Age*. Tel Aviv: Tel Aviv University Press.

Yakar, J. and Gursan-Salzmann, A. 1979. Archaeological survey in the Malatya and Sivas Provinces – 1977. *Tel Aviv* 6, 34-53.

Yardımcı, N. 1993. Excavations, surveys and restoration works at Harran. In M. Frangipane, H. Hauptmann, M. Liverani, P. Matthiae, and M. Mellink (eds.). *Between the Rivers and the Mountains. Archaeologica Anatolica et Mesopotamica Alba Palmieri Dedicata*, 473-449. Rome: La Sapienza.

Yener, K.A., 1983. The production, Exchange, and Utilization of Silver and Lead Metals in Ancient Anatolia. *Anatolica 10*: 1-15.

Yener, K., 2005. *The Amuq Valley Regional Projects. Surveys in the plain of Antioch and Orontes Delta, Turkey 1995-2002.* Chicago: The Oriental Institute of the University of Chicago.

Yener, K. A., 2010. *The 2003-2004 Excavations Seasons*. Istanbul: Koc University Press.
Yilmaz, O., 2012. *Domesticated Donkey*. Ankara: Veni Vidi Vici Publications.

Yoffee, N., and Clark, J. (eds.), 1993. *Early Stages in the Evolution of Mesopotamian Civilization*. Tucson: University of Arizona Press.

Yoshida, D. 2002. Ein altassyrische Texts aus Kaman-Kalehöyük. *Anatolian Archaeological Studies 11*, 133-37.

Young, T. C., Jr., 1969. Survey in Western Iran, 1961. *Journal of Near Eastern Studies 25*, 228-239.

Zaccagnini, C., 1999-2001. The Mina of Karkemiš and Other Minas. *States Archives of Assyria Bulletin 13*, 39-56.

Zaccagnini, C., 2000. A Note on Old Assyrian Weight Stones and Weight Systems. In: Graziani, S. (ed.), *Studi Sul Vicino Oriente dedicati alla memoria di Luigi Cagni.* Napoli: Herder, 1202-1213.

Zeyrik, T.H., and Kiziltan, Z., 2005. Some Selected Mesopotamian Weights from Istanbul Archaeological Museums. *Anadolu 18*, 15-63.

Zimmermann, T. 2005. Perfumes and Policies – A 'Syrian Bottle' from Kinet Höyük and Anatolian Trade Patterns in the Advanced Third Millennium BC, *Anatolica* 31:161-9.

Zimmermann, T. 2006. Bottles and Netbags – Some additional notes on the article about 'Syrian Bottles' in Anatolica 31. *Anatolica 32,* 229-231.

Zipf, G. K., 1949. *Human Behavior and the Principle of Least Effort*. Cambridge, MA: Harvard University Press.

Spatial Approaches to the Political and Commercial Landscape of the Old Assyrian Colony Period

Volume 2

Figures

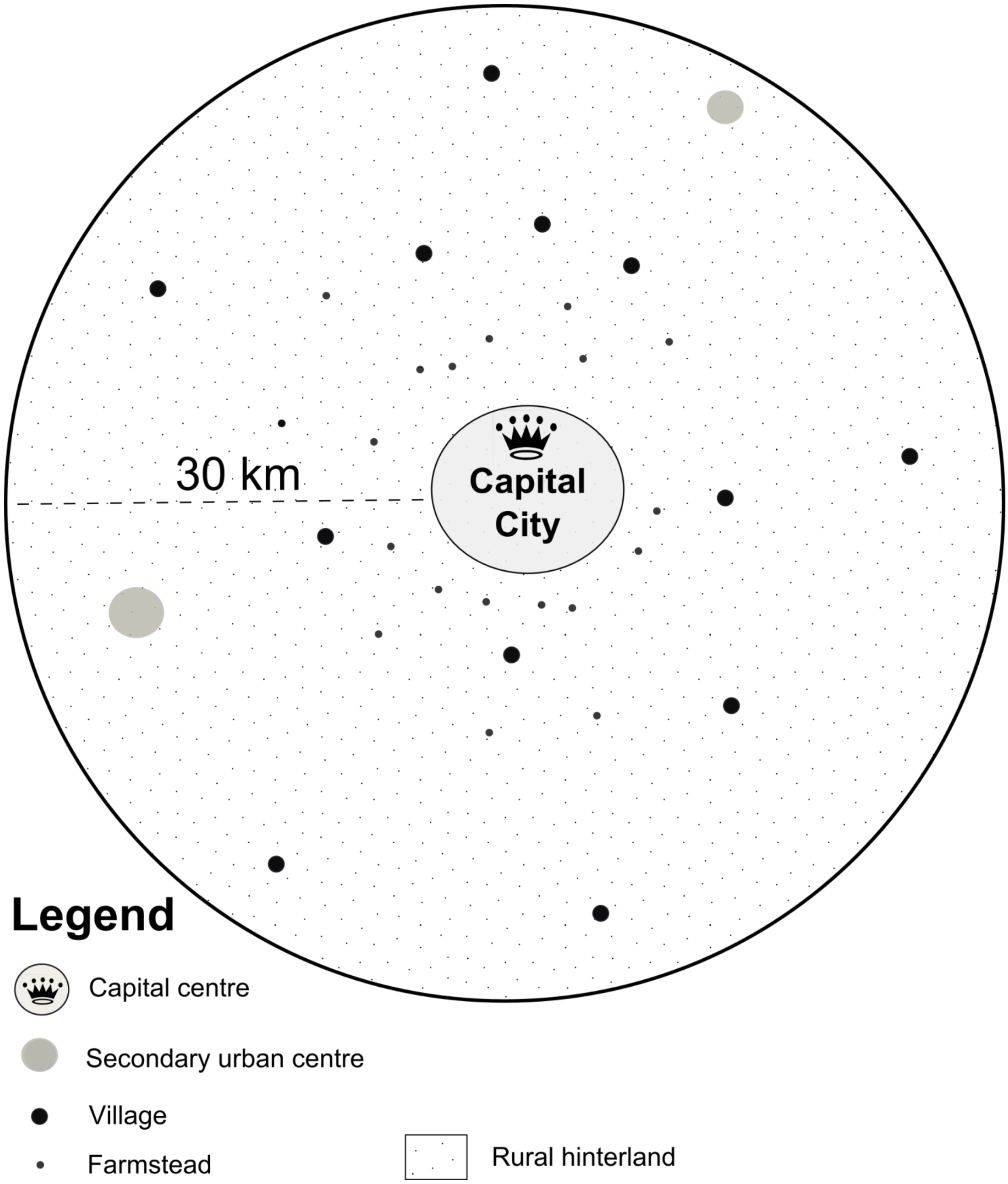

Figure 1. A schematic, highly stylised model of city-state.

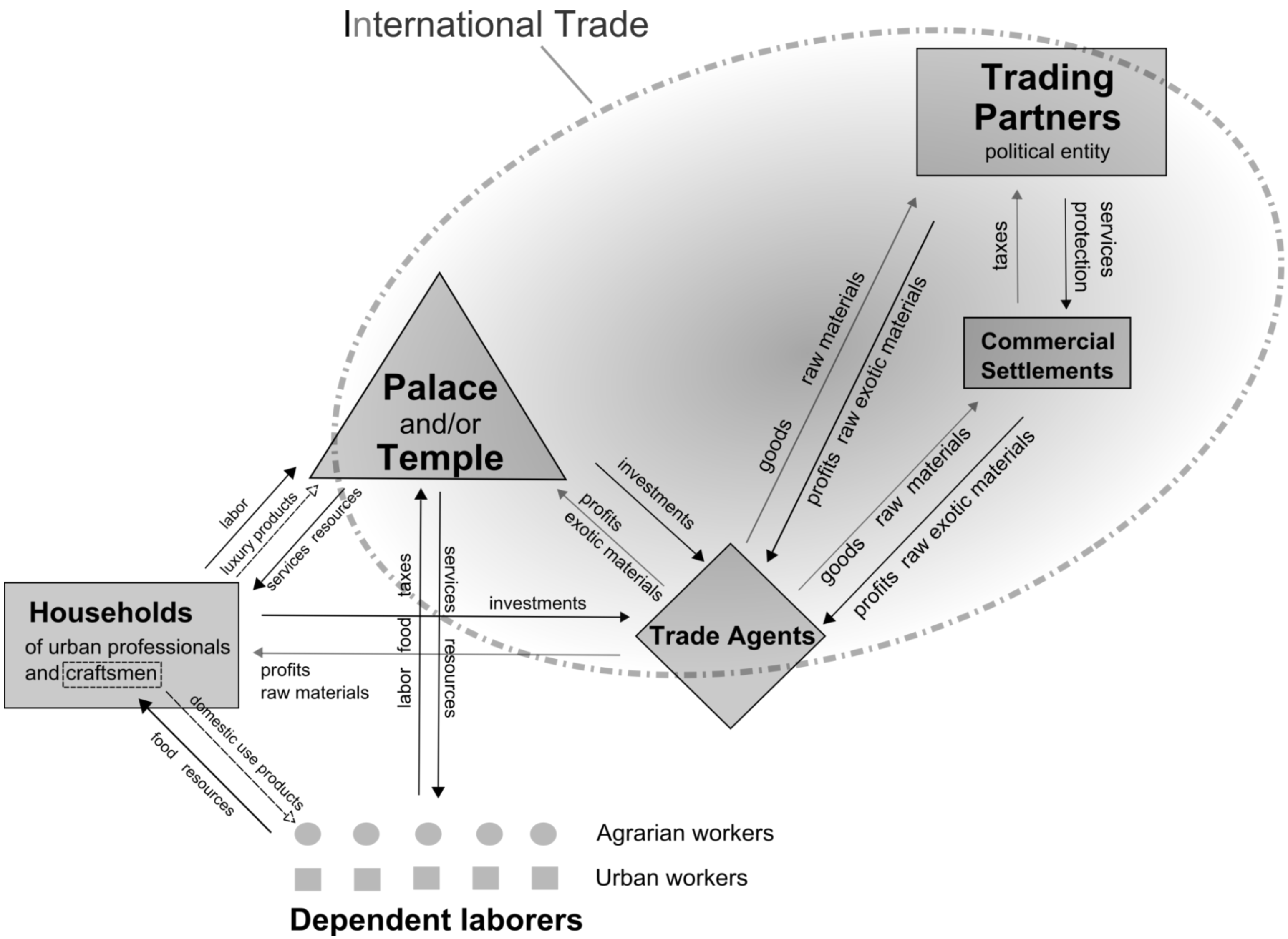

Figure 2. A schematic model of early pre-industrial economies in the Near East.

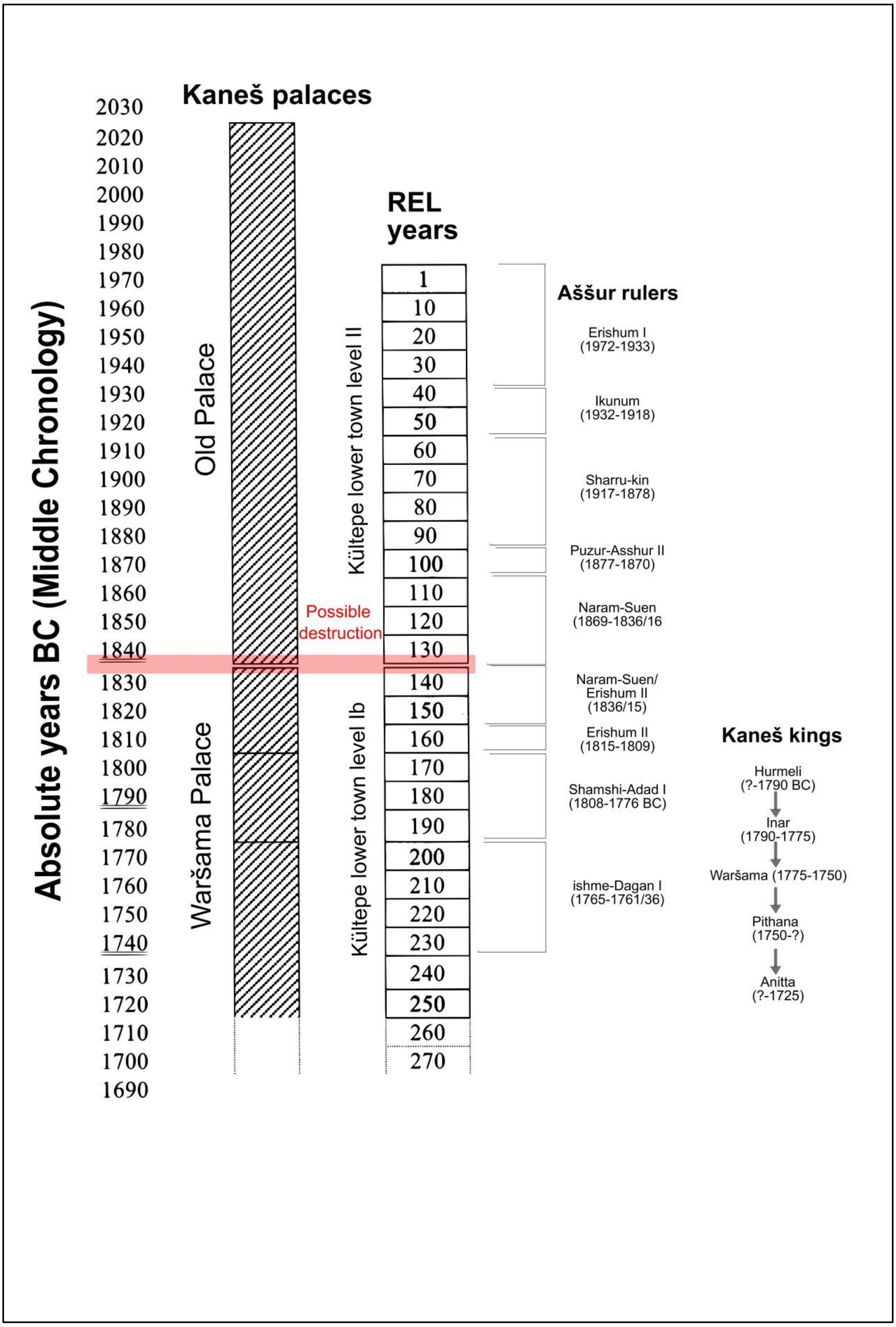

Figure 3. Middle Chronology in absolute and Revised Eponym List (REL) years (modified from Barjamovic et al. 2012).

Rulers	Regnal years	Suggested date BC
Erišum I	40	1972-1933
Ikūnum	15	1932-1918
Šarru-ken	40	1917-1878
Puzur-Aššur II	8	1877-1870
Narām-Suen	34 (or 54)	1869-36/16
Erišum II	27 (or 7)	1836/15-1809
Šamši – Adad I	33	1808-1776
Išme-Dagan I	15 (or 40?)	1775-1761/1736(?)

Figure 4. The absolute chronology of the Old-Assyrian period and the reigns of its rulers based on the Kültepe Eponym Lists (KEL; Source: Barjamovic *et al.* 2012).

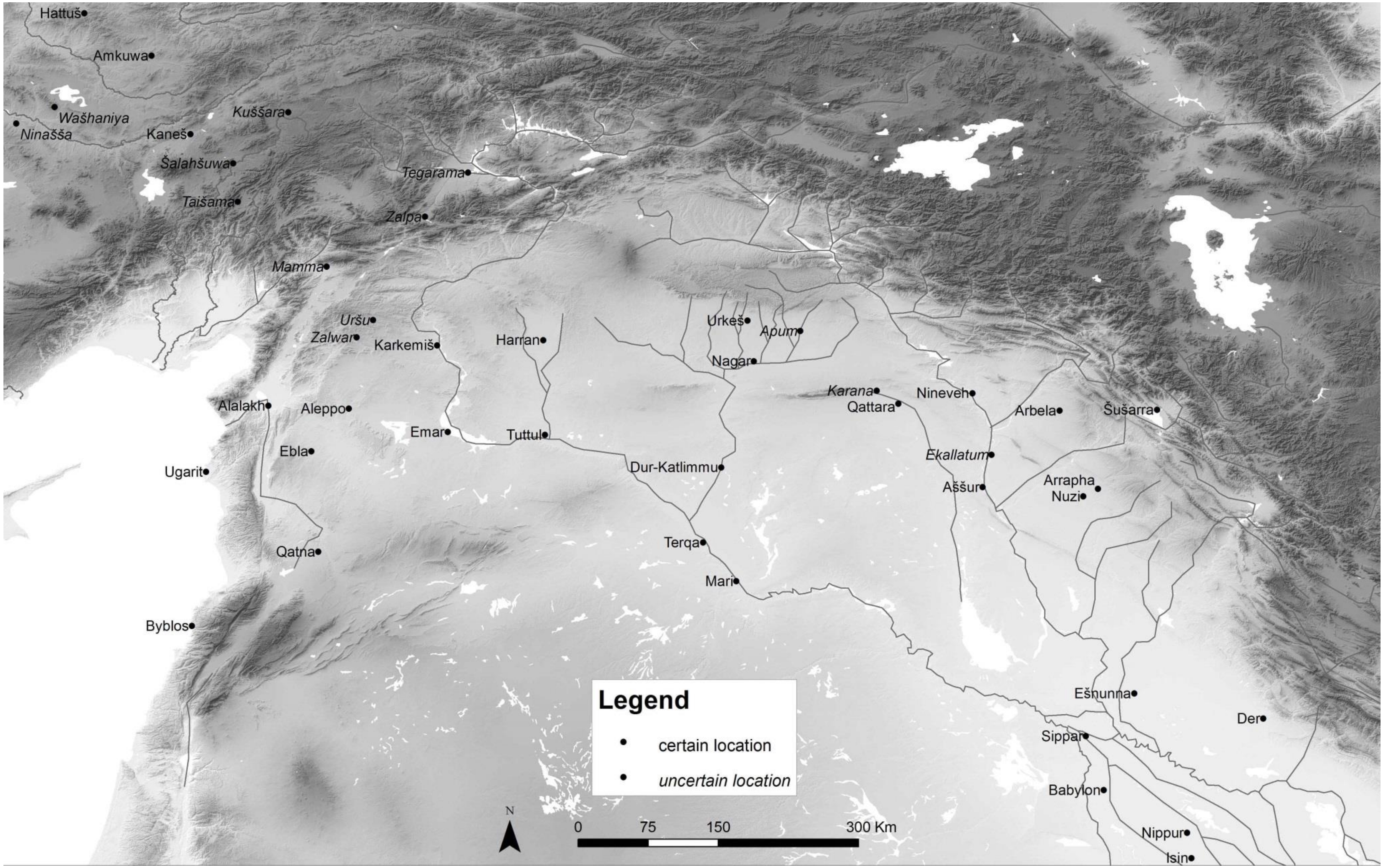

Figure 5. South-eastern Anatolia and Upper Mesopotamia in the early second millennium BC.

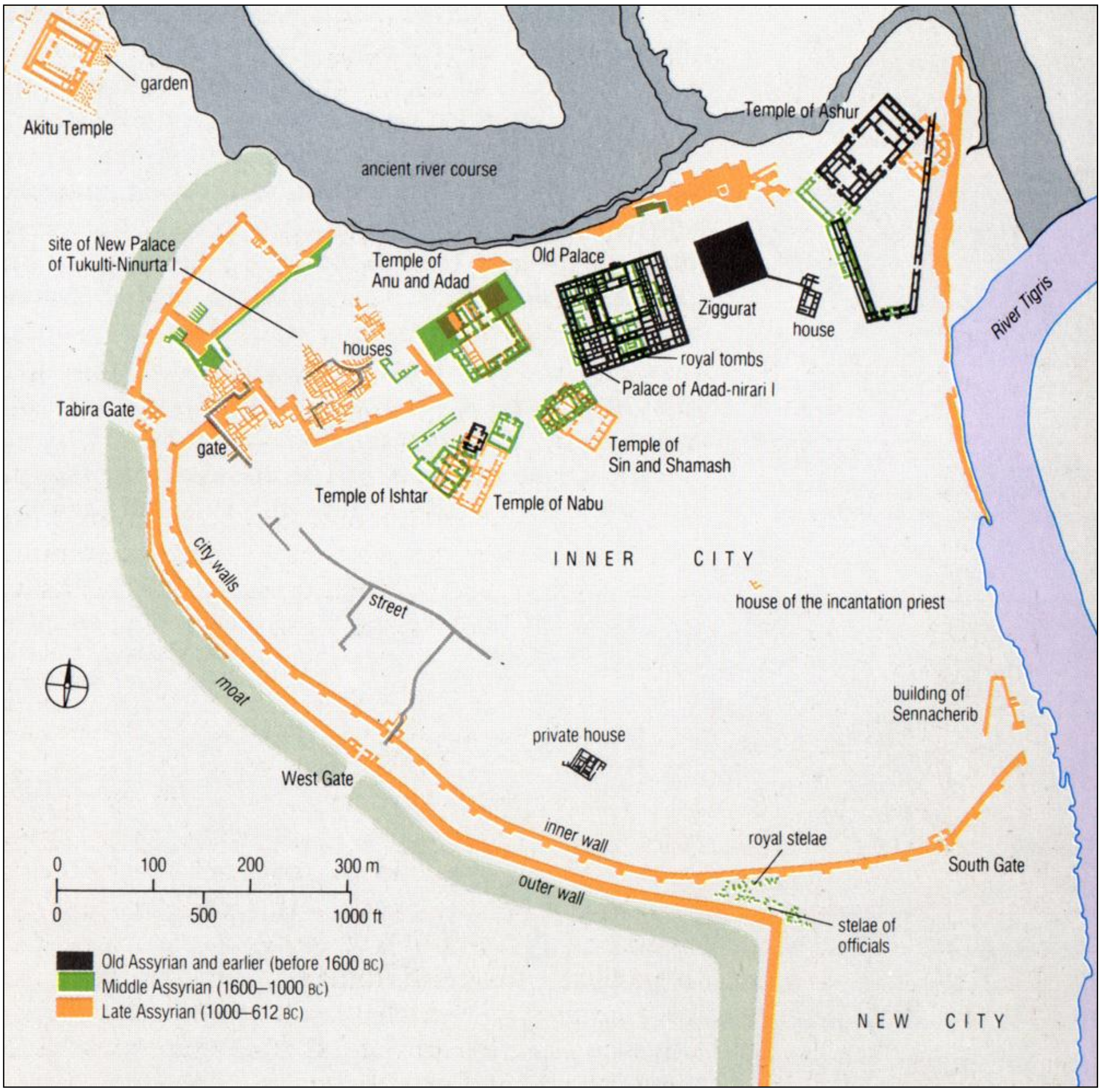

Figure 6. Plan of the city of Aššur (*after* Roaf 2004).

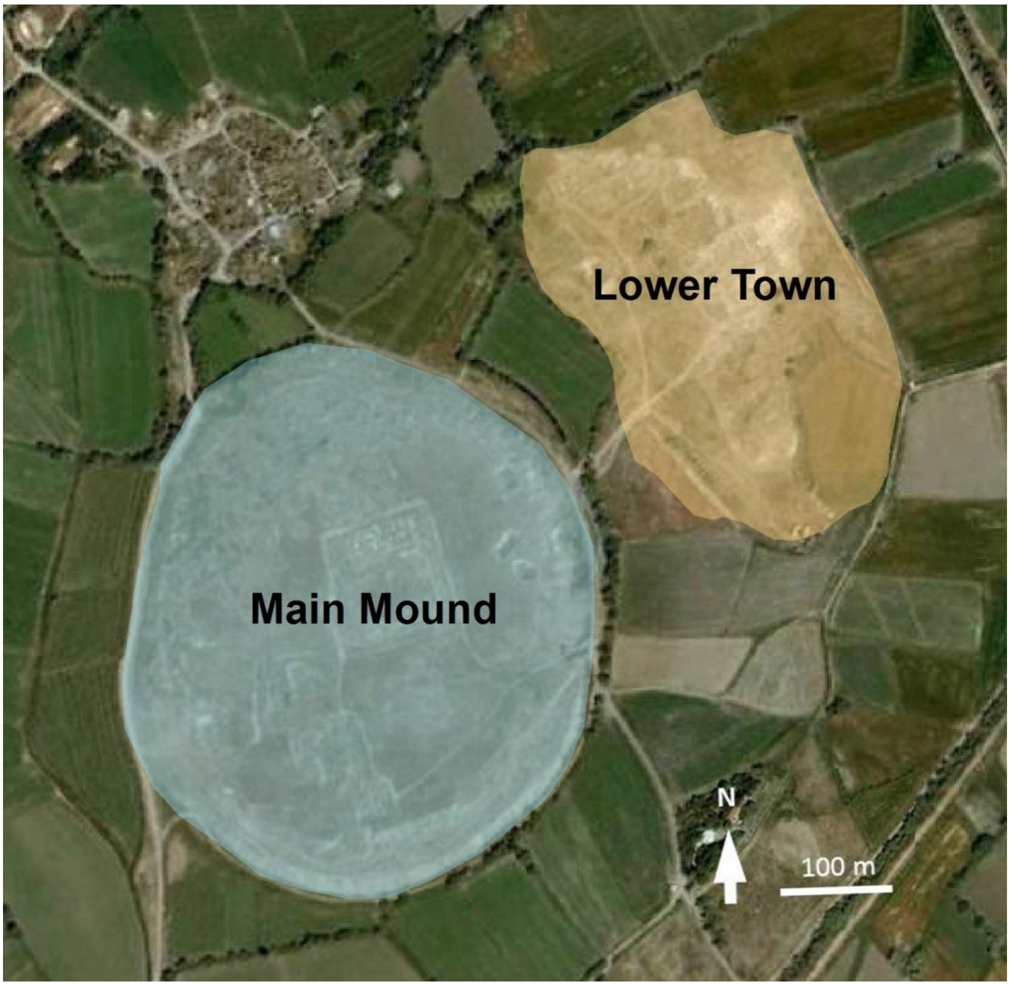

Figure 7. Kültepe's main mound (Höyük) and lower town.

Upper Town ***Main Mound***	**Lower Town**	**Period**
Level 18		Early Bronze Age I
Levels 17-14		Early Bronze Age II
Levels 13-11		Early Bronze Age III
Level 10 Level 9	Level IV Level III	Late third– early second millennium BC
Level 8	Level II	ca. 1970-1835 BC
Level 7	Level Ib	ca. 1835-17th c. BC
Level 6	Level Ia	ca. 17th c. BC
Levels 5-4		Iron Age
Level 3		Hellenistic
Levels 2-1		Roman

Figure 8. Periodization of Kültepe’s mound and lower town levels.

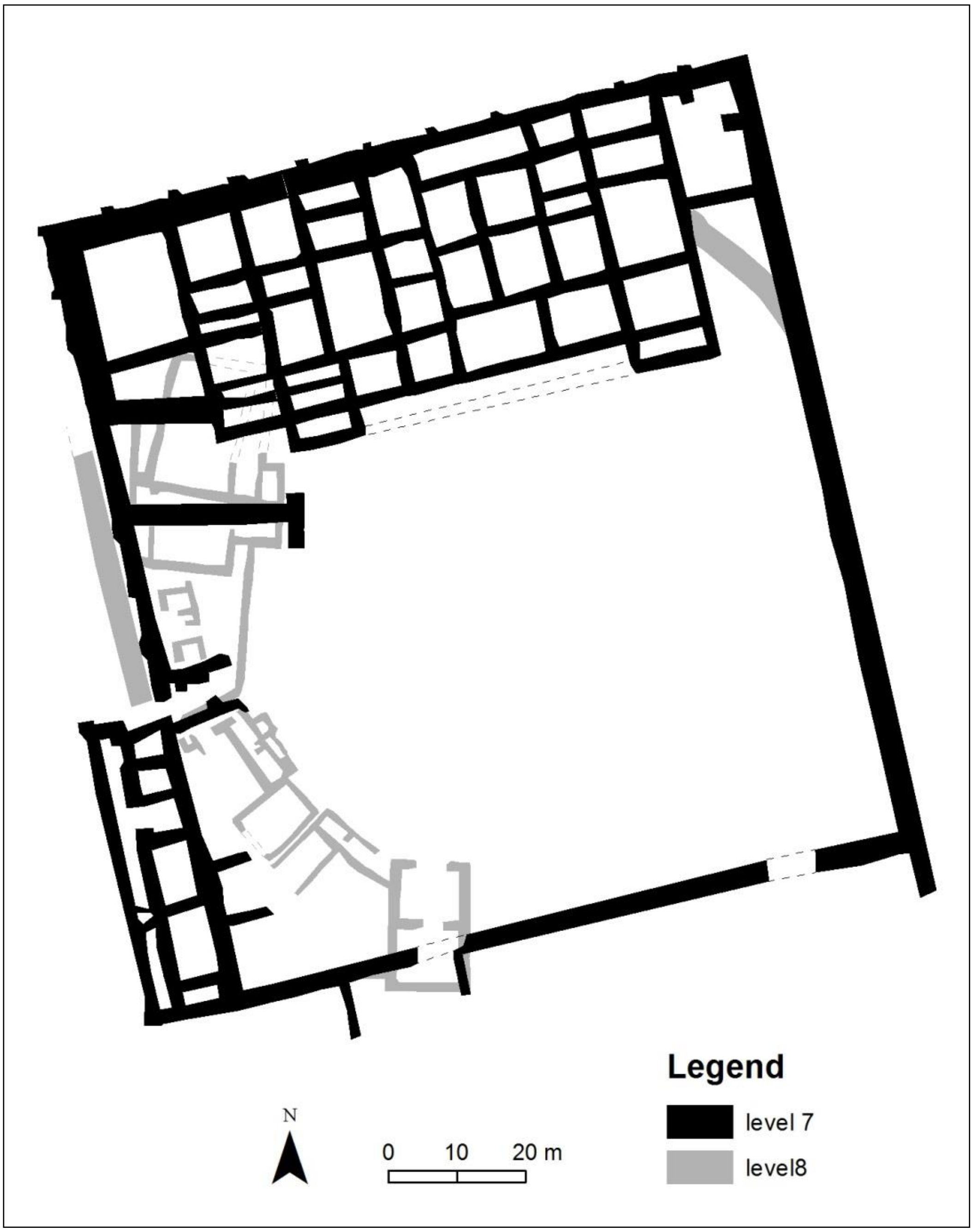

Figure 9. The Old Palace (level 8) and the Waršama's palace (level 7) on Kültepe's main mound.

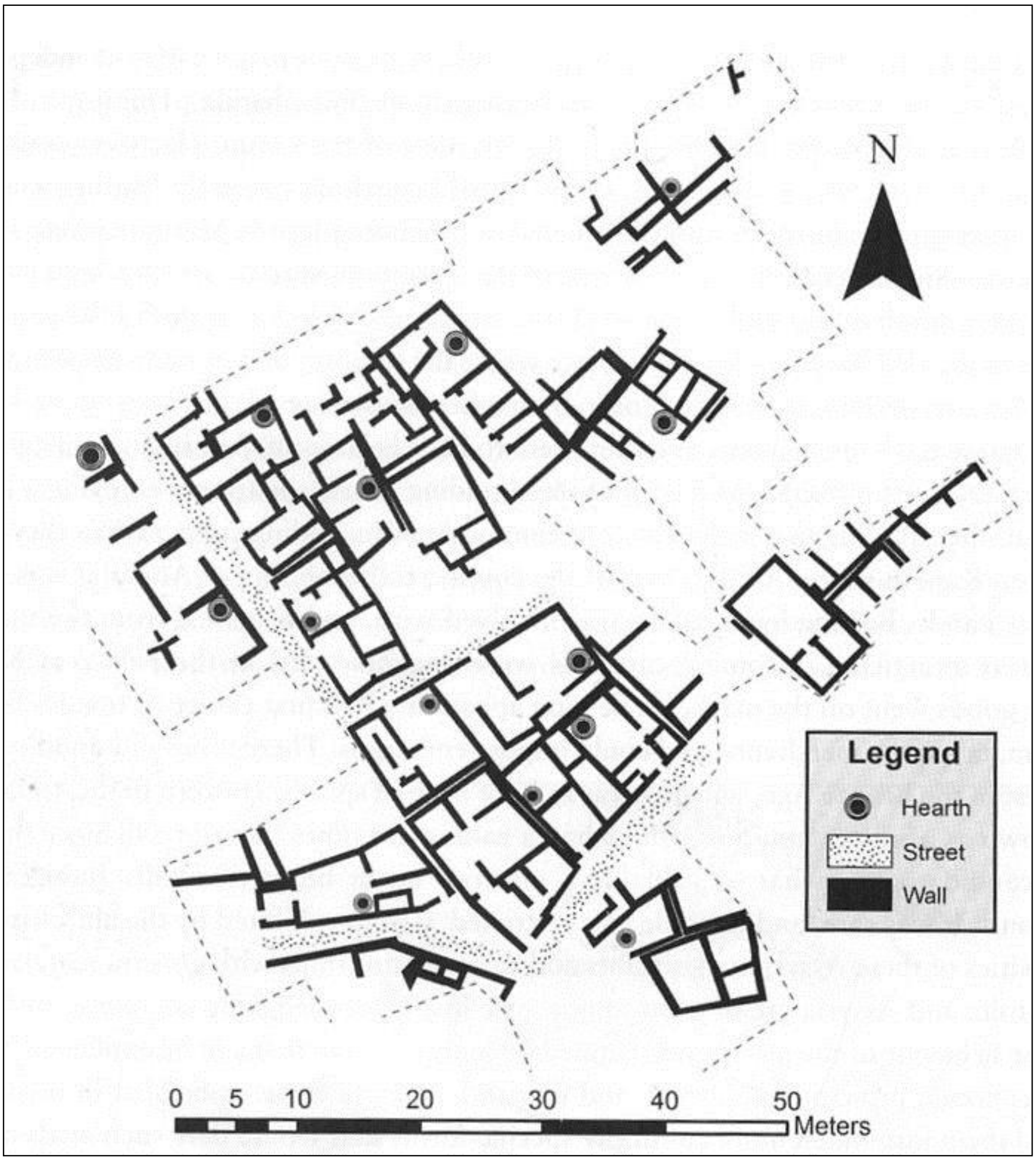

Figure 10. Plan of a group of private houses in Kültepe's lower town level II (*after* T.Özgüç 1986, plan 1).

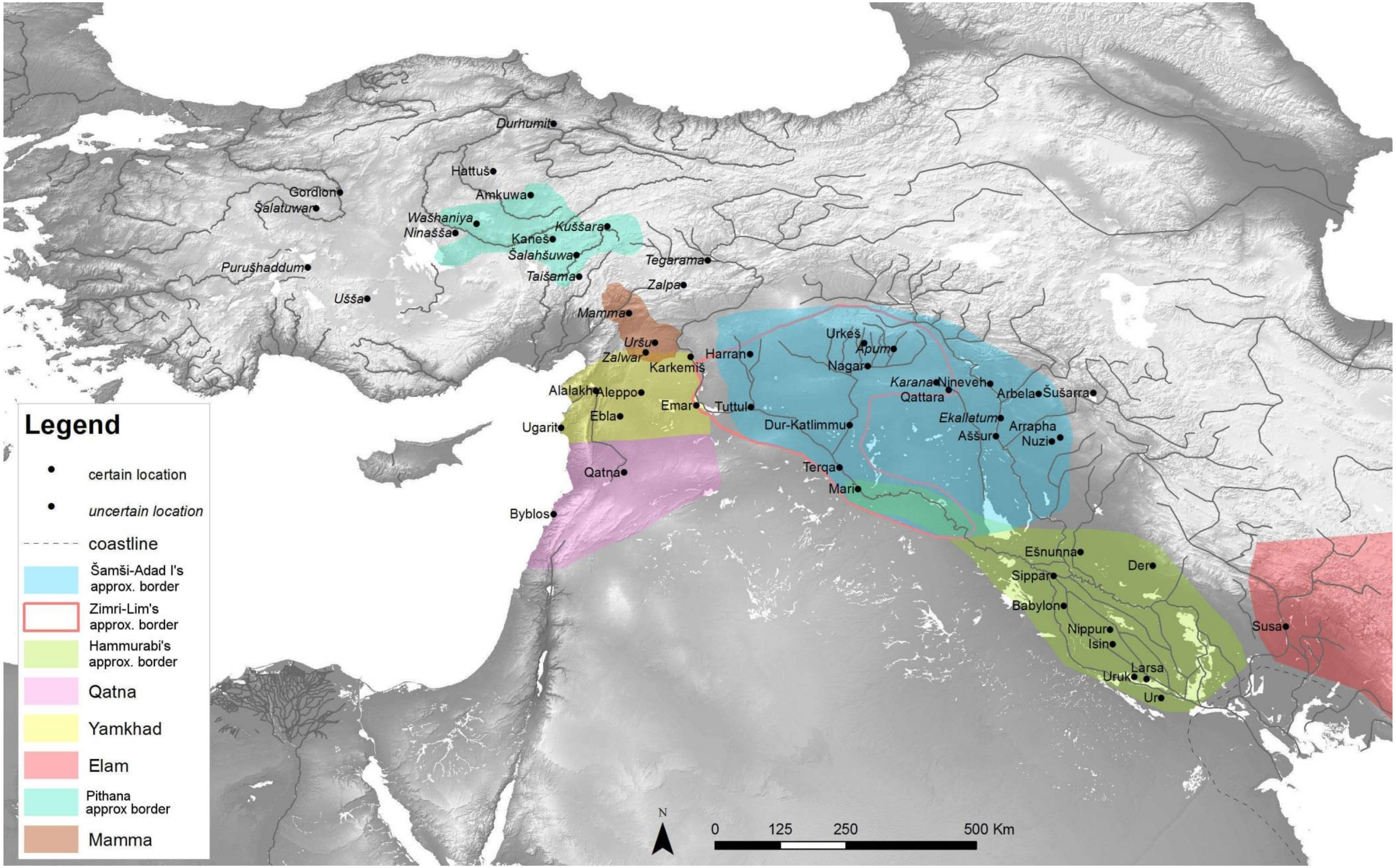

Figure 11. The Near East in the 18th century BC.

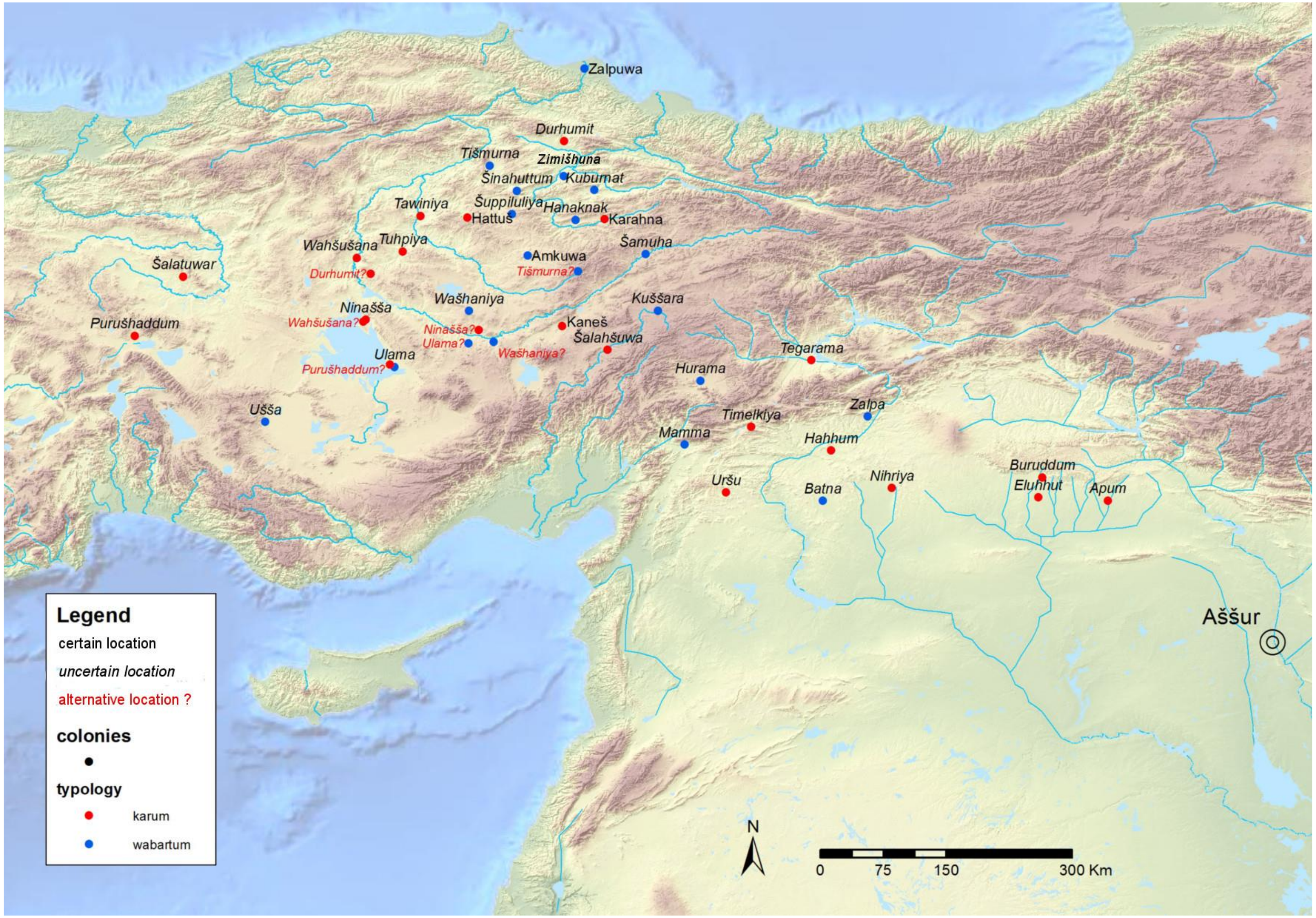

Figure 12. Distribution of Old Assyrian commercial settlements during Kültepe's lower town level II (ca. 1970-1835 BC).

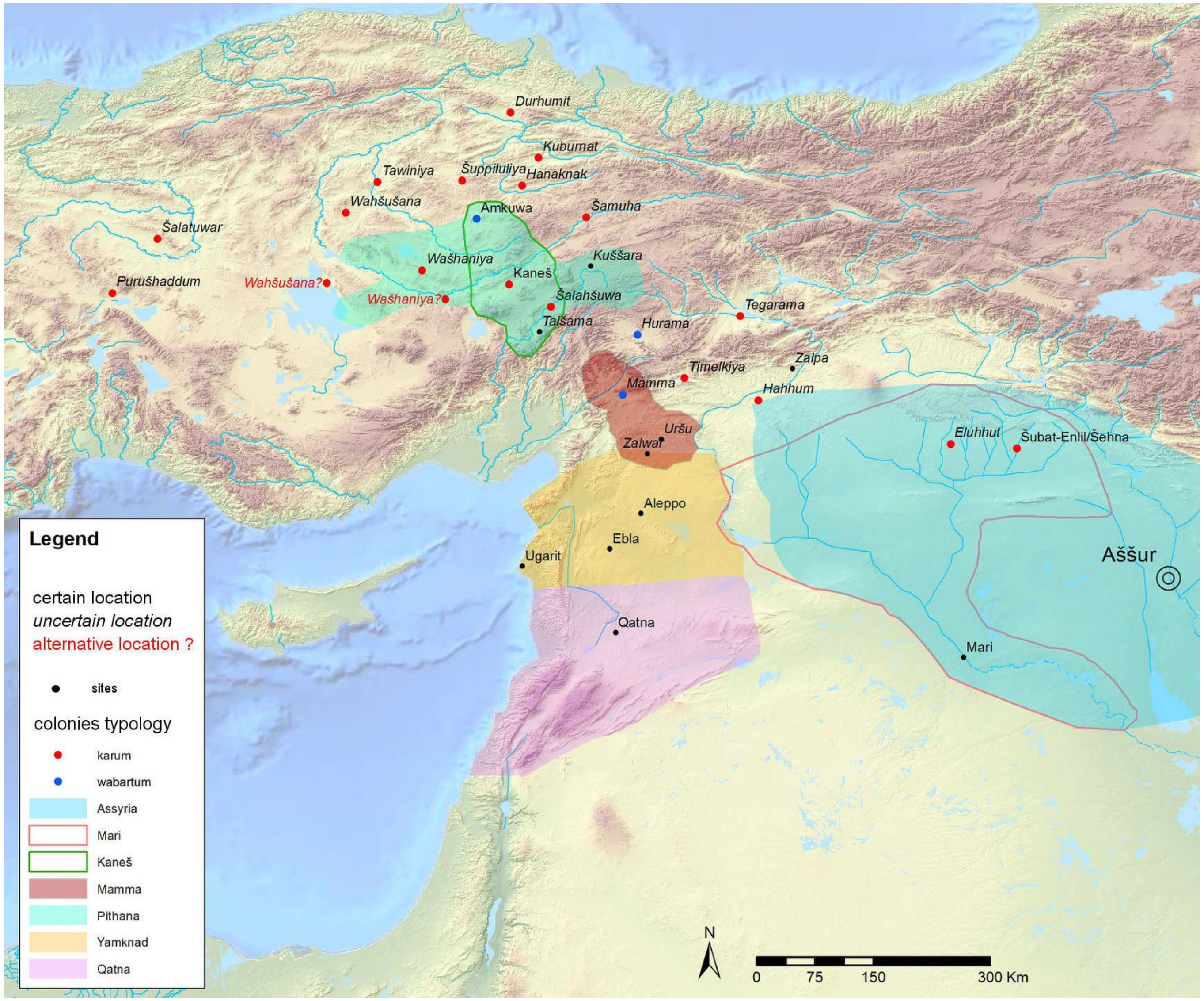

Figure 13. Distribution of Old Assyrian commercial settlements during Kültepe's lower town level Ib (ca. 1835-17th c. BC).

Toponym	Location	Level II (ca. 1970-1835 BC)	Level Ib (ca. 1835-17th c.BC)
Amkuwa	Ališar Höyük	W	W
Apum	Tell Aid **or** Tell Muhammad Diyab	K	
Batna	South of Viranşehir	W	
Buruddum	Plain of Mardin (Gulharin?)	K	
Durhumit	Plain of Merzifon (Suluova) **or** around Balkan	K	K
Eluhhut	South of Mardin	K	K
Hahhum	Samsat or its neighbourhood	K	K
Hanaknak	Plain of Kadişehri	W	K
Hattuš	Boğazköy	K	
Hurama	Plain of Elbistan (Karahöyuk)	W	W
Kaneš	Kültepe	K	K
Karahna	Sulusaray	K	
Kuburnat	Plain of Turhal and Zile (Kösele Tepe) **or** Bolus	W	K
Kuššara	North of the plain of Elbistan	W	
Mamma	Kahramanmaraş province	W	W
Nihrīya	Ovest of Viranşehir (Kazane Höyük?) **or** (Huzirina/Sultantepe)	K	
Ninašša	Harmandali , Varavan **or** south east of Hacıbektaş	K?	
Purušhaddum	Acemhöyük **or** around Bolvadin	K	K
Šalahšuwa	Zamanti plain (Limpara Höyük)	K	K
Šalatuwar	Near Sivrihisar, Kepen Höyük	K	K
Šamuha	Near Sivas (Kayalıpınar)	W	K
Šimala	?	K	
Šinahuttum	North-east of Boğazköy	W	
Šubat-Enlil/Šehna	Tell Leilan		K
Šuppiluliya	Between Boğazköy and Sulusaray (Yassıhöyük)	W	K
Tawiniya	West of Boğazköy	K	K
Tegarama	Plain of Malatya	K	K
Timelkiya	Near Gölbaşı	K	K
Tišmurna	Around Çorum **or** north of Kaneš	W	
Tuhpiya	South of Delice (Büyükkale/Kuçükkale)	W → K	

Ulama	Acemhöyük **or** south of Hacibektaš, left bank of the Kızılırmak River	W	
Upē	?	W	
Uršu	Around Gaziantep	K	
Uššа	Plain of Konya (Karahöyük)	W	
Wahšušana	Köprüköy/Büklükkale **or** Harmandalı, Varavan	K	K
Wašhaniya	around Kirşehir **or** the north-east of Aksaray	W →	K
Zalpa (north) / Zalpuwa	Ikiztepe at Bafra	-	
Zalpa (south)	Up river from Samsat	W → K	
Zimišhuna	Around Gediksaray and Ayvalıpınar	W	

Figure 14. Suggested location of main toponyms hosting Assyrian commercial settlements in Central Anatolia and Upper Mesopotamia (Source:Veenhof and Eidem 2008, 154-155; Forlanini 2008; Barjamovic 2011a, table 39).

Legend:

Site Name: certain location
K: kārum
W: wabartum;
→ : upgrade of status

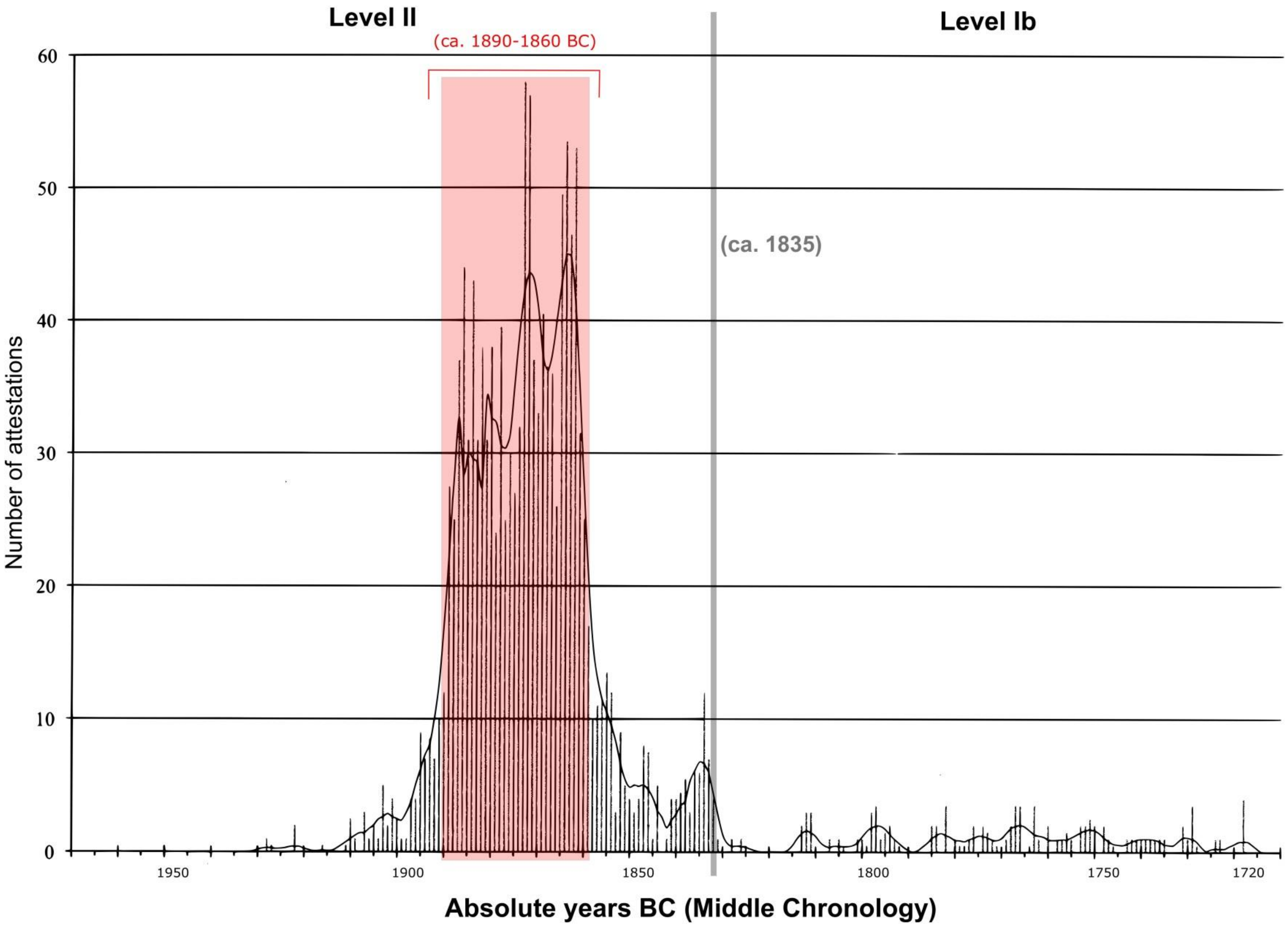

Figure 15. Chronological distribution of texts found in Kültepe's lower town (modified from Barjamovic *et al.* 2012).

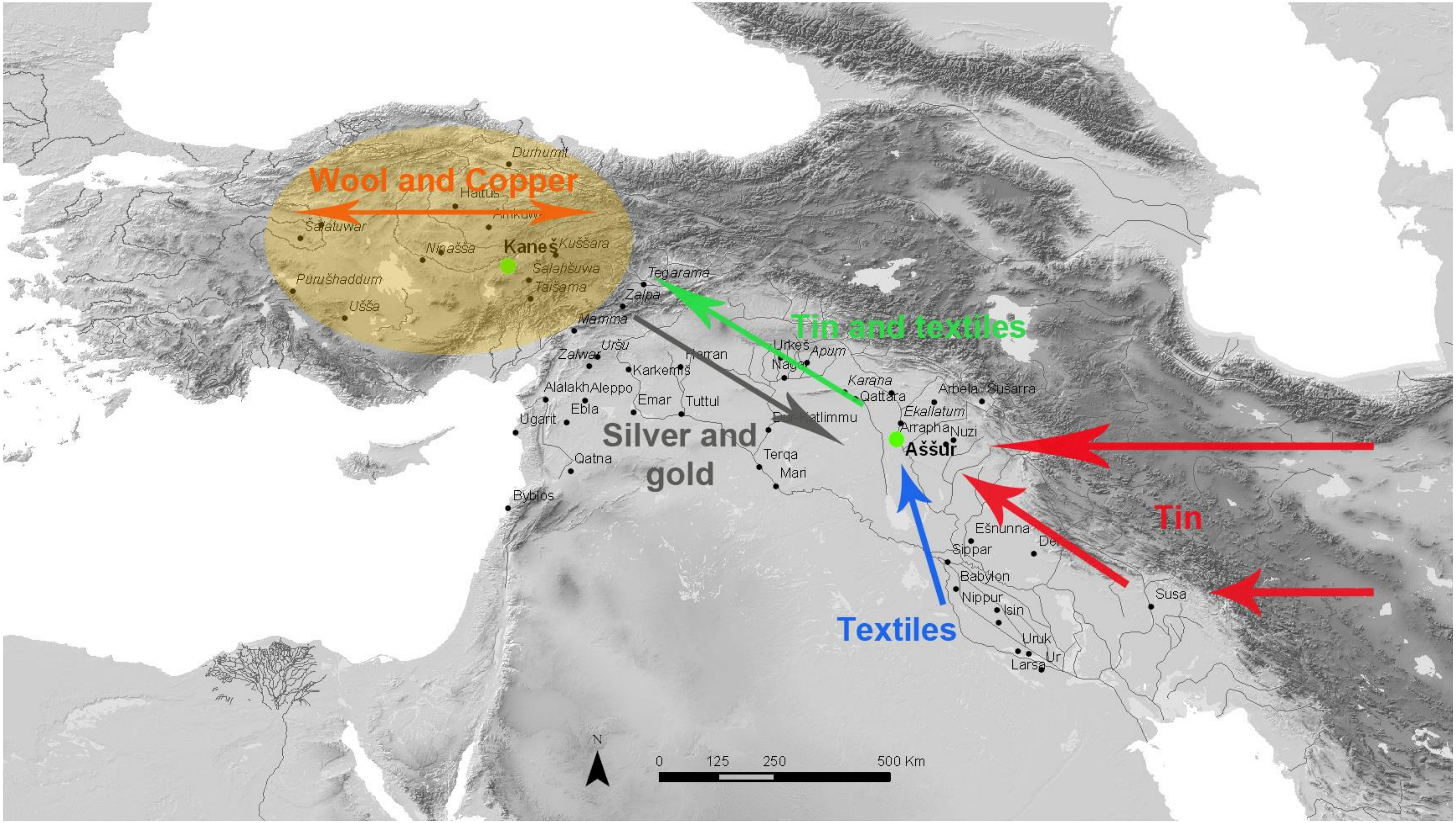

Figure 16. Old Assyrian trade schematic model.

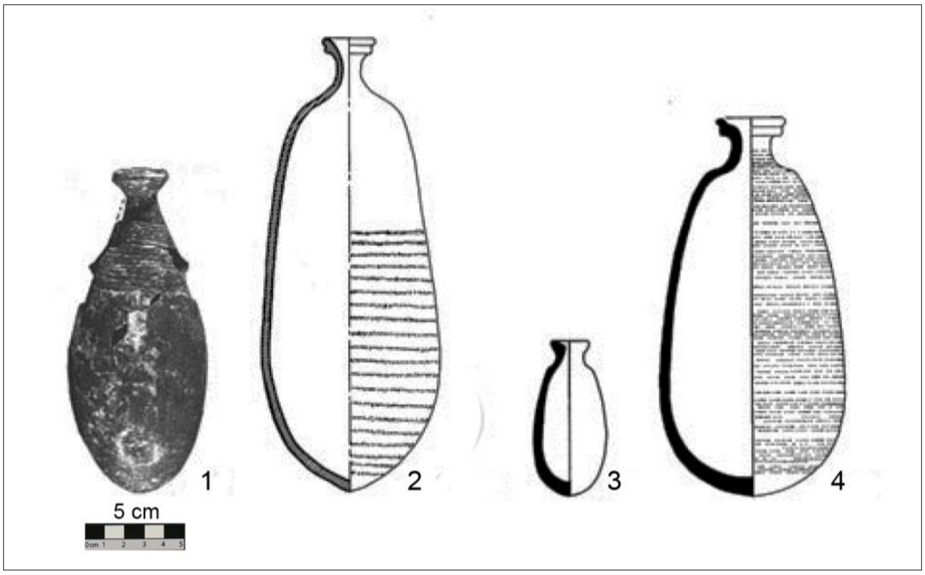

Figure 17. Alabastron type Syrian Bottles from Eskiyapar (1), Kültepe (2), Tell Bi’a (3) and Tell Brak (4).

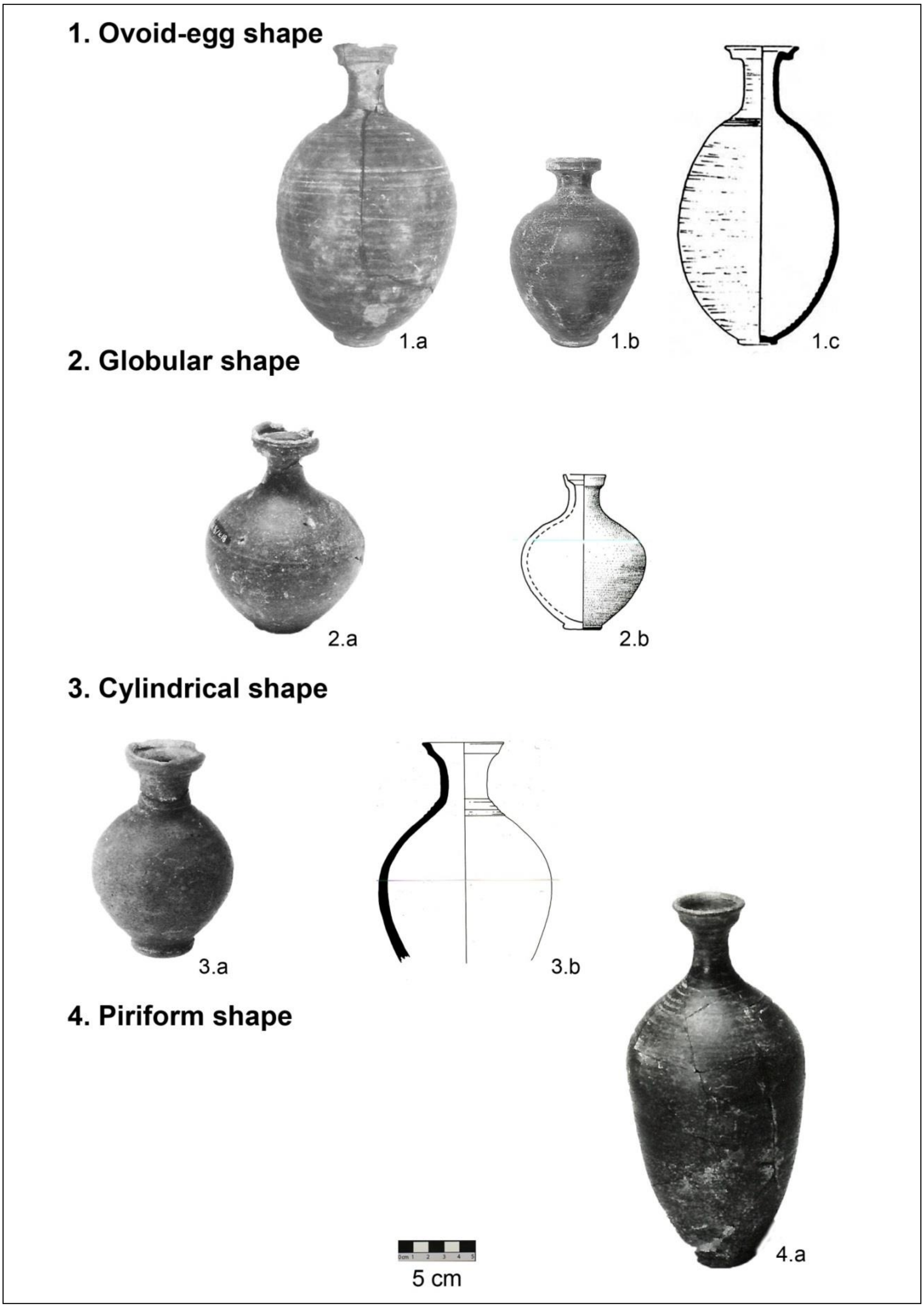

Figure 18. Different typologies of Syrian Bottles.

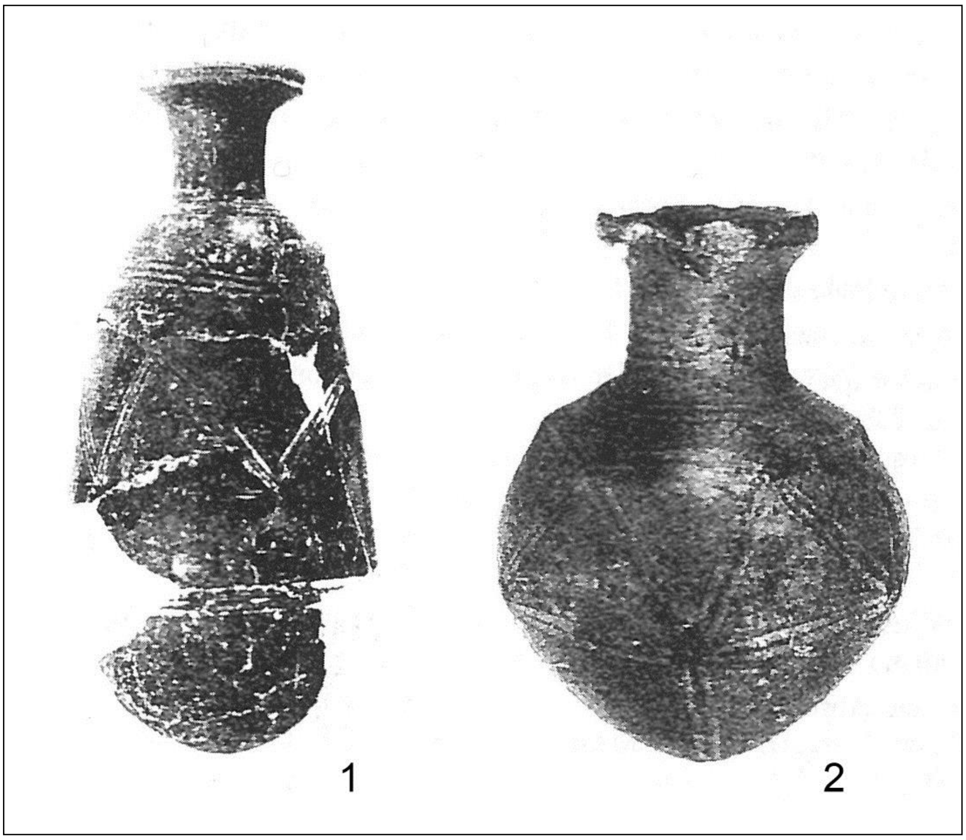

Figure 19. Locally made Syrian bottles with grooved "net bag" motifs from Kültepe.

1.Palamari/Skyros
2.Tell Galabovo
3.Hisarlik / Troia
4.Demircihüyük
5.Küçükhöyük
6.Küllüoba
7.Karahöyük
8.Açemhöyük
9. Eskiyapar
10.Alisar Höyük
11.Kültepe
12.Kestel/Göltep
13.Tarsos
14.Kinet Höyük
15.Tilmen Hoyuk
16.Zinçirli
17.Gedikli/Karahoyuk
18.Tall Tayinat
19.Saraqib
20.Tell Mardikh
21.Hama
22.al-Ansari/Aleppo
23.Oylum Höyük
24.Gaziantep
25. Tilbeshar
26. Amarna
27. Mezraa Höyük
28.Gre Virike
29.Tell Shiyukh Tahtani
30.Qara Quzak
31.Kara Hasan
32.Hadidi
33.Al-Qitar
34.Tell es-Sweyhat
35.Shamseddin
36.Wreide
37.Habuba Kabira
38.Tawi
39.Halawa
40.Malatya
41.Arslantepe
42.Kurban Höyük
43.Lidar Höyük
44.Titris Höyük
45.Harran
46.Tell Gidle
47.Tell Hammam et-Turkman
48.Tell Bi'a
49.Norshuntepe
50.Dehliz
51.Tell Chuera
52.Tell Kharab Sayyara
53.Tell Beydar
54.Abu Hgaira
55.Tell Melebiya
56.Tell Bderi
57.Tell Knedig
58.Chagar Bazar
59.Tell Brak
60.Girnavaz
61.Terqa
62.Mari

Figure 20. Distribution of Syrian Bottles in the Third millennium BC (Redrawn from Rahmstorf 2006a)

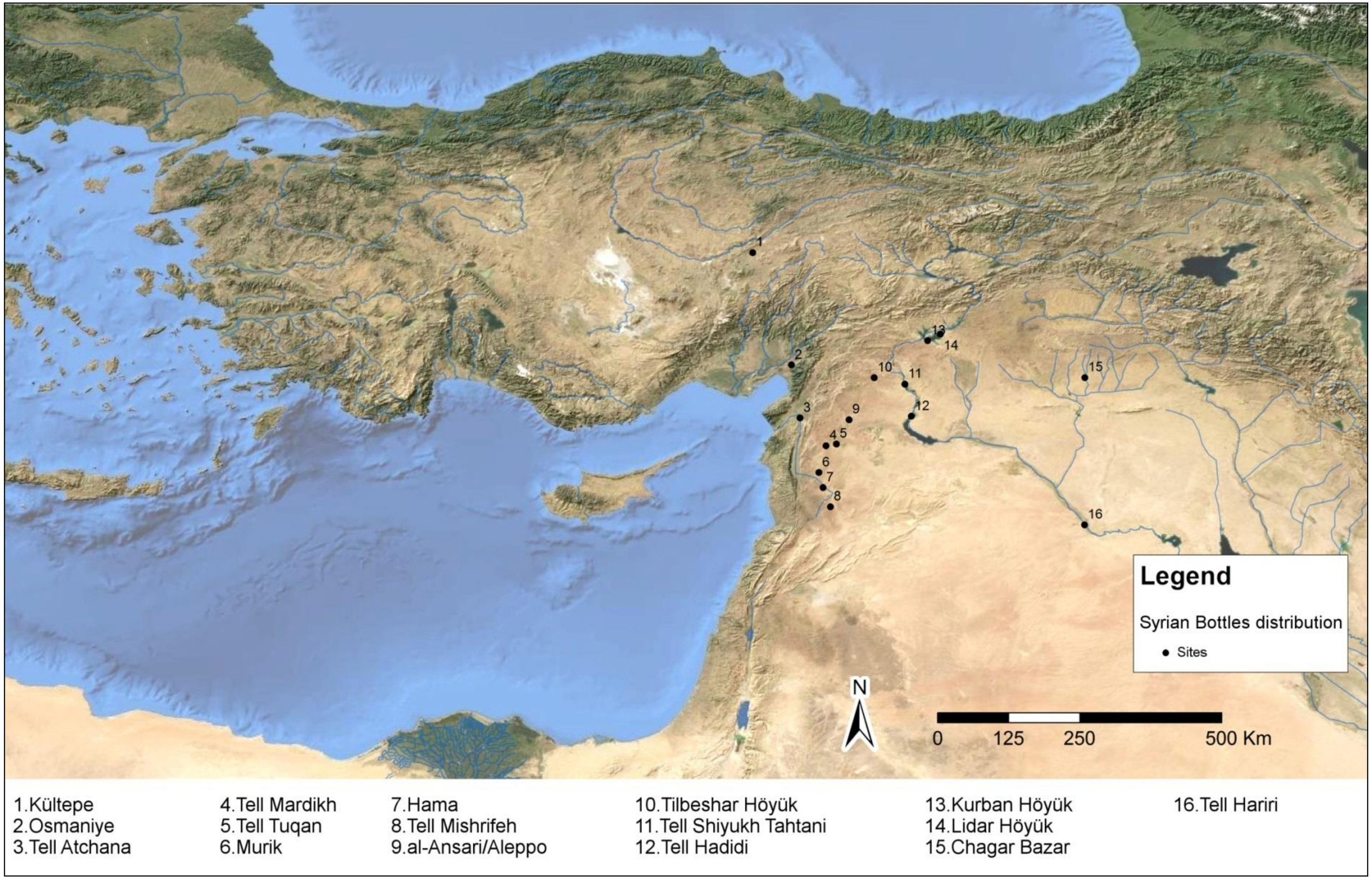

Figure 21. Distribution of Syrian Bottles in the early second millennium BC (ca. 2000-1700 BC).

Site	Map no.	Area	No. items	References
Kültepe	1	Central Anatolia	6	Emre 1999
Osmaniye	2	SE Anatolia	1	Mesnil du Buisson 1930b, pl. XXXIII
Tell Atchana	3	SE Anatolia	38	Woolley 1955, 330; Heinz 1992, pl. 12: 47-49; Yener 2010, 215-229.
Tell Mardikh	4	NW Syria	10	Marchetti and Nigro 1997, 10-11; Matthiae *et al.* 1995, 456; Nigro 2002, 92.
Tell Tuqan	5	NW Syria	1	Peyronel 2006, 184-185
Murik	6	NW Syria	2	Riis and Buhl 2007, 43-48
Hama	7	NW Syria	5	Fugmann 1958; Riis and Buhl 2007
Tell Mishrifeh	8	NW Syria	4	Mesnil du Buisson 1927 and 1930
Al-Ansari/Aleppo	9	NW Syria	2	Suleiman 1973, pl. VI: 62-63
Tilbeshar Höyük	10	SE Anatolia	1	Kepinski 2005, 150
Tell Shiyukh Tahtani	11	NW Syria	4	Falsone and Sconzo 2008 and 2010
Tell Hadidi	12	NW Syria	1	Franken 1978
Kurban Höyük	13	SE Anatolia	4	Algaze 1990, pl. 104: A-B, pl. 133: H-I
Lidar Höyük	14	SE Anatolia	19	Kaschau 1999
Chagar Bazar	15	Khabur Triangle	1	Mallowan 1937, 139
Tell Hariri (Mari)	16	Middle Euphrates	4	Lebeau 1983, Fig. 3:4,7; Jean Marie 1999, pl. 129:6, pl. 148:3

Figure 22. List of sites yielding Syrian bottles from Middle Bronze Age contexts.

Context	Frequency (No.)	Percentage (%)
Domestic (1)	15	14.56
Funerary (2)	40	38.85
Palatial(3)	9	2.91
Religious (4)	8	8.73
Unstratified	36	34.95
Total	103	100

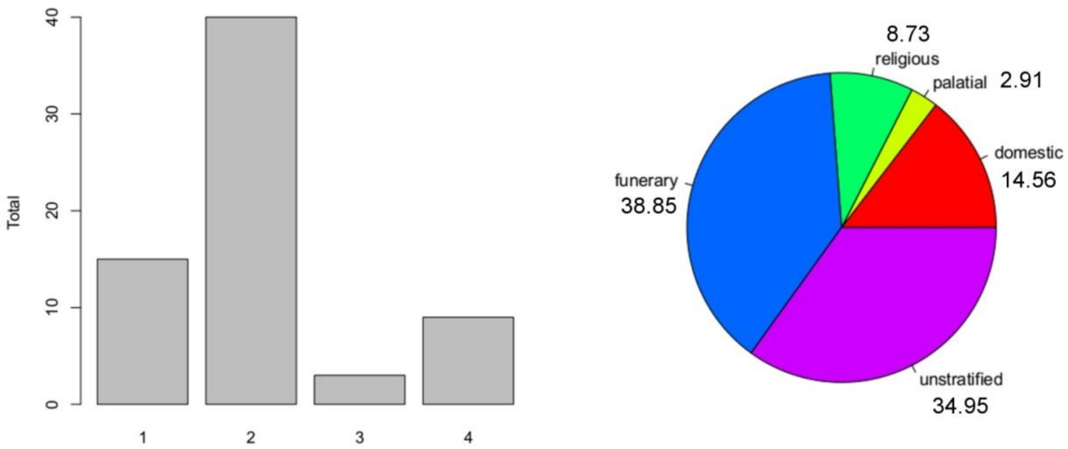

Figure 23. Frequency and percentage of Syrian Bottles by context.

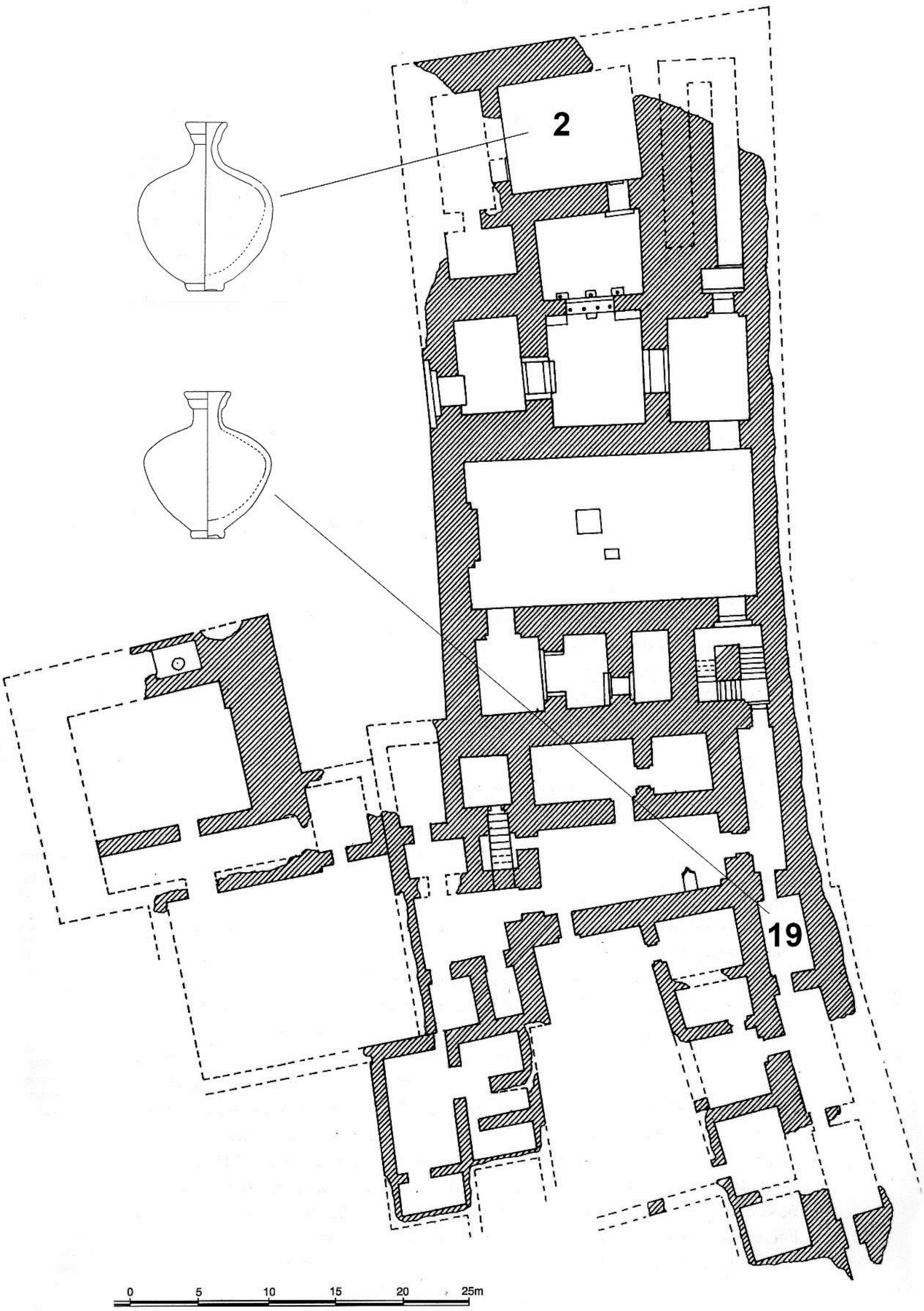

Figure 24. Syrian Bottles from Alalakh's palace, level VII.

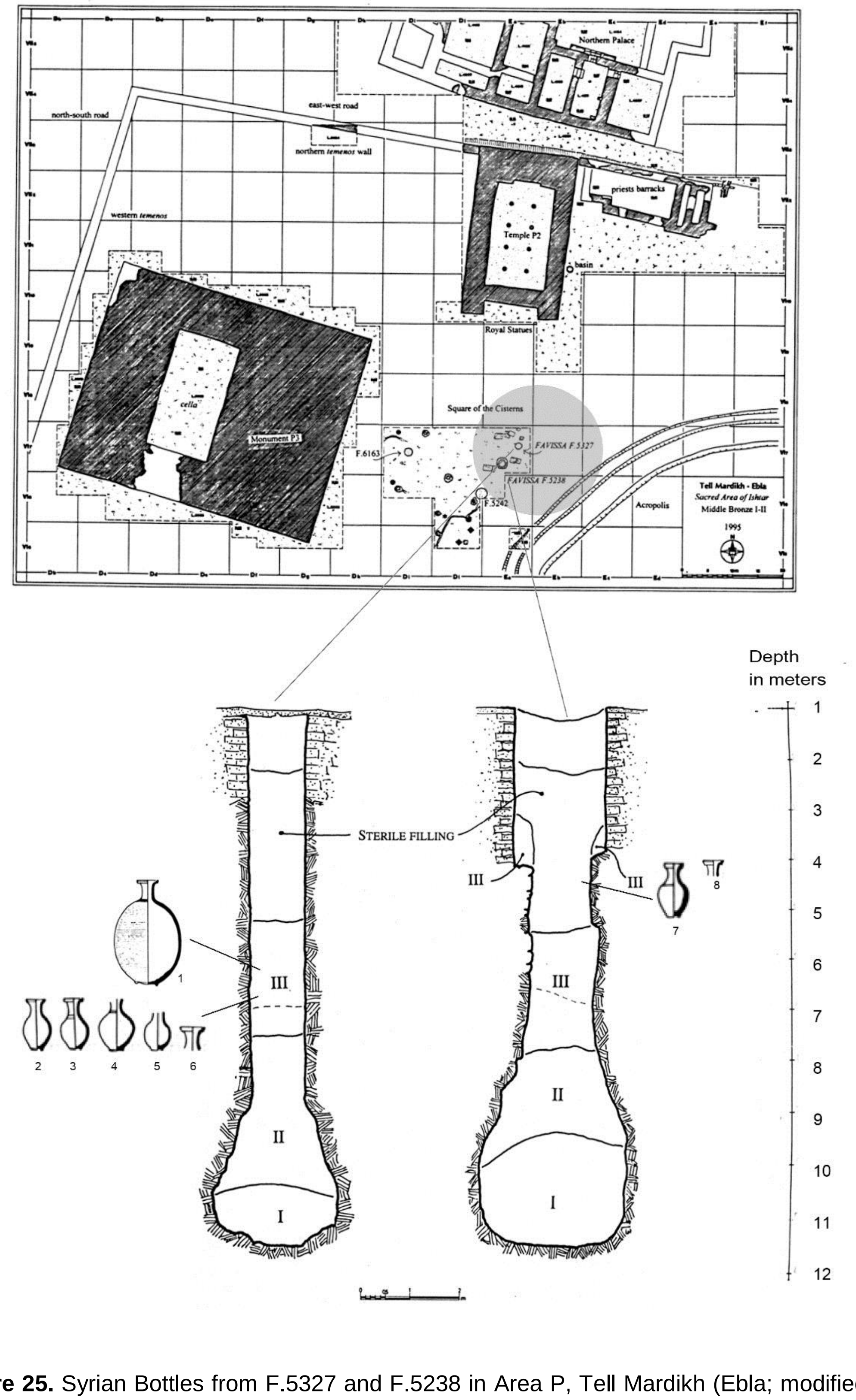

Figure 25. Syrian Bottles from F.5327 and F.5238 in Area P, Tell Mardikh (Ebla; modified from Marchetti and Nigro 1997).

References to the illustration on fig. 17

1. Özgüç 1986, Fig. 3:9. Eskiyapar.

2. Özgüç 1986, Fig. 3:3. Kültepe.

3. Strommenger and Kohlmeyer 1998, Pl. 177. Tell Bi'a.

4. Oates et al. 2001. Fig. 190.Tell Brak.

References to the illustration on fig. 18

1. a. Emre 1999, Pl. I:1. Kültepe, level Ia.

1. b. Emre 1999, Pl. I:2. Kültepe, level Ia.

1. c. Nigro 2002, Fig, 92. Tell Mardikh, Tomb of the Lord of the Goats.

2. a. Emre 1999, Pl. I:3. Kültepe, level Ia.

2. b. Yener 2010, 218.Tell Atchana, phase 3 (level VII).

3. a. Emre 1999, Pl. I:4. Kültepe, level Ia.

3. b. Lebeau 1983, Fig. 7:4. Tell Hariri, Chantier A, grave 18.

4. a. Emre 1999, Pl. II:2. Kültepe, level Ib.

References to the illustration on fig. 19

1. Özgüç 1986, Fig. 3:8. Kültepe, level 11.

2. Özgüç 1986, Fig. 3:13. Kültepe, level 14.

References to the illustration on fig. 24

1. Heinz 1992, Pl. 12:49. Tell Atchana, palace, room 2, level VII.

2. Heinz 1992, Pl. 12:47. Tell Atchana, palace, room 19, level VII.

References to the illustration on fig. 25

1. Marchetti and Nigro 1997, Fig. 6:12. Tell Mardikh, F.5327.

2. Marchetti and Nigro 1997, Fig. 6:17. Tell Mardikh, F.5327.

3. Marchetti and Nigro 1997, Fig. 6:18. Tell Mardikh, F.5327.

4. Marchetti and Nigro 1997, Fig. 6:19. Tell Mardikh, F.5327.

5. Marchetti and Nigro 1997, Fig. 6:20. Tell Mardikh, F.5327.

6. Marchetti and Nigro 1997, Fig. 6:21. Tell Mardikh, F.5327.

7. Marchetti and Nigro 1997, Fig. 7:23. Tell Mardikh, F.5238.

8. Marchetti and Nigro 1997, Fig. 7:24. Tell Mardikh, F.5238.

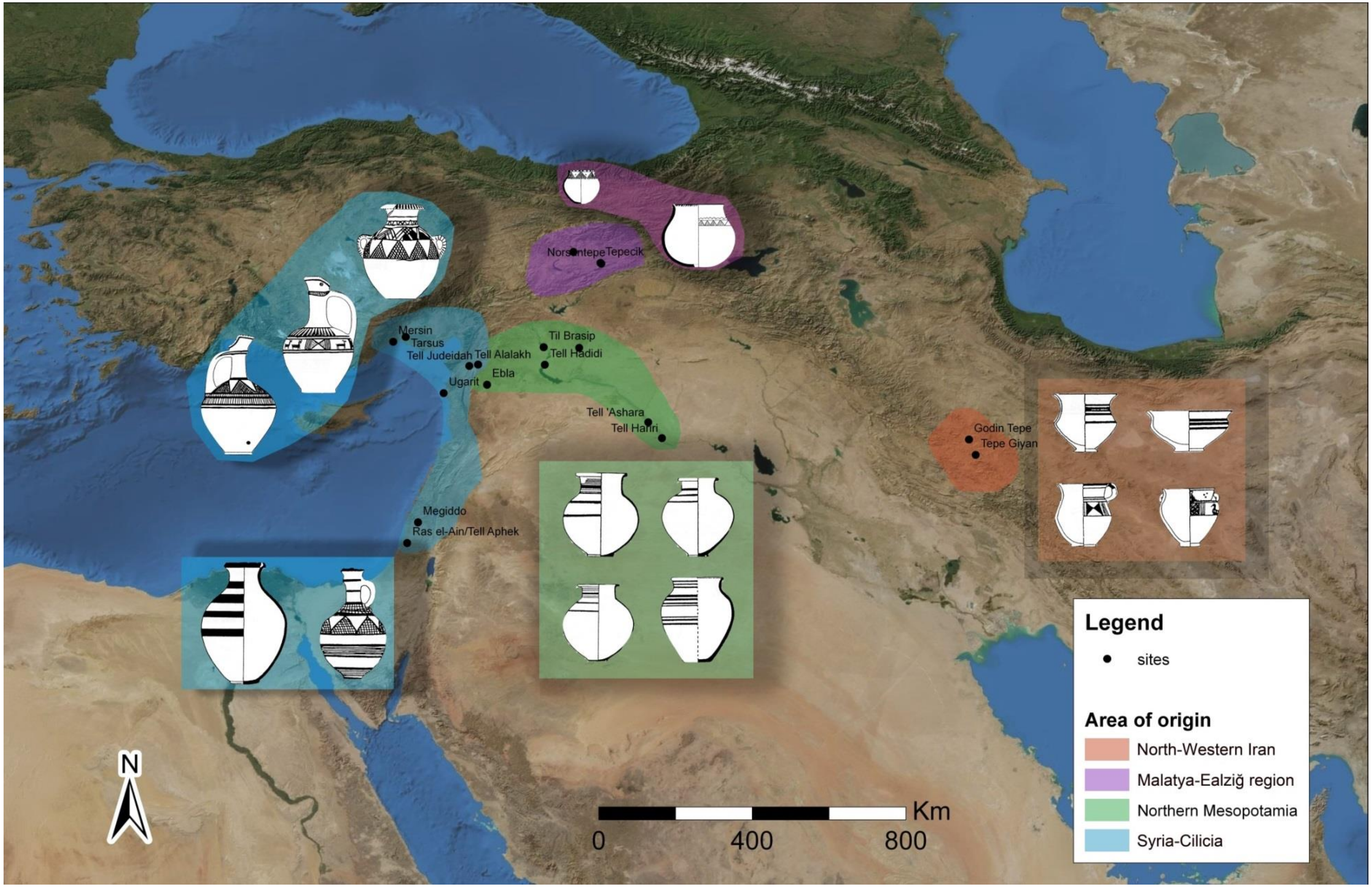

Figure 26. Possible areas for Khabur Ware's origin.

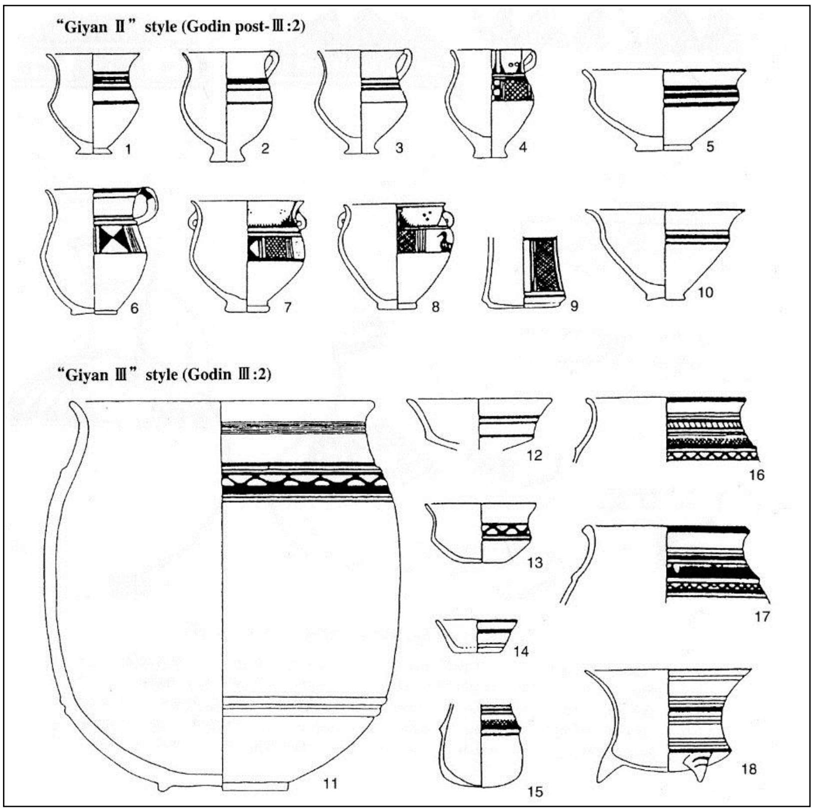

Figure 27. "Giyan" painted pottery from Godin Tepe (*after* Oguchi 2001, fig. 1).

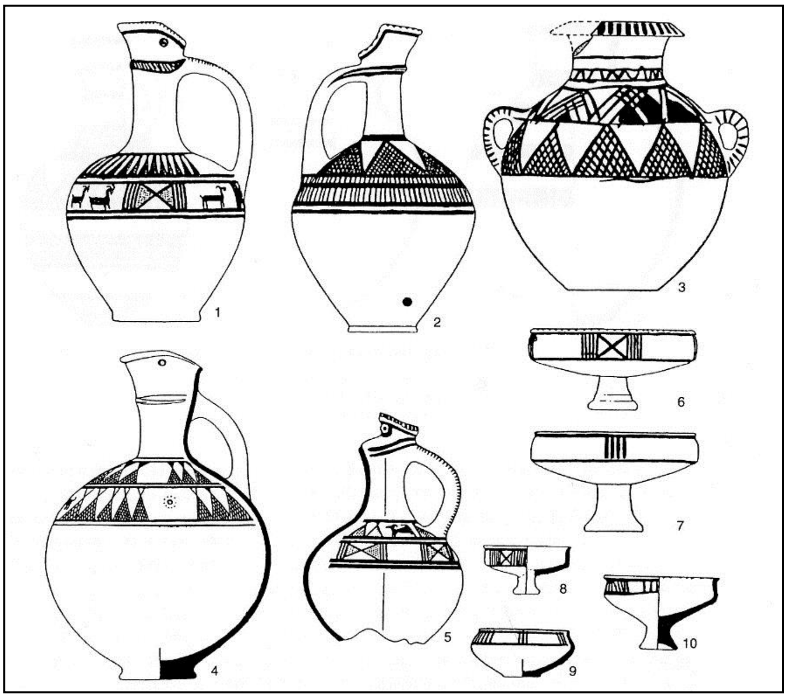

Figure 28. Syro-Cilician painted pottery from Alalakh (n.1), Ugarit (n. 2), Tarsus (3, 6-7), Mersin (4, 8-10) and Tell Judeidah (n. 5) (*after* Oguchi 2001, fig. 2).

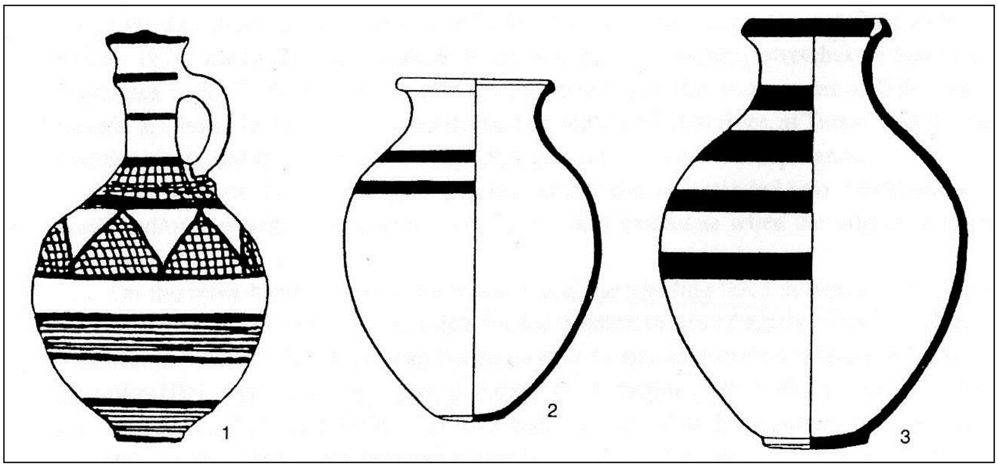

Figure 29. MBIIA Palestinian painted ware from Ras el-Ain (n. 1) and Megiddo (n. 2-3) (*after* Oguchi 2001, fig. 3).

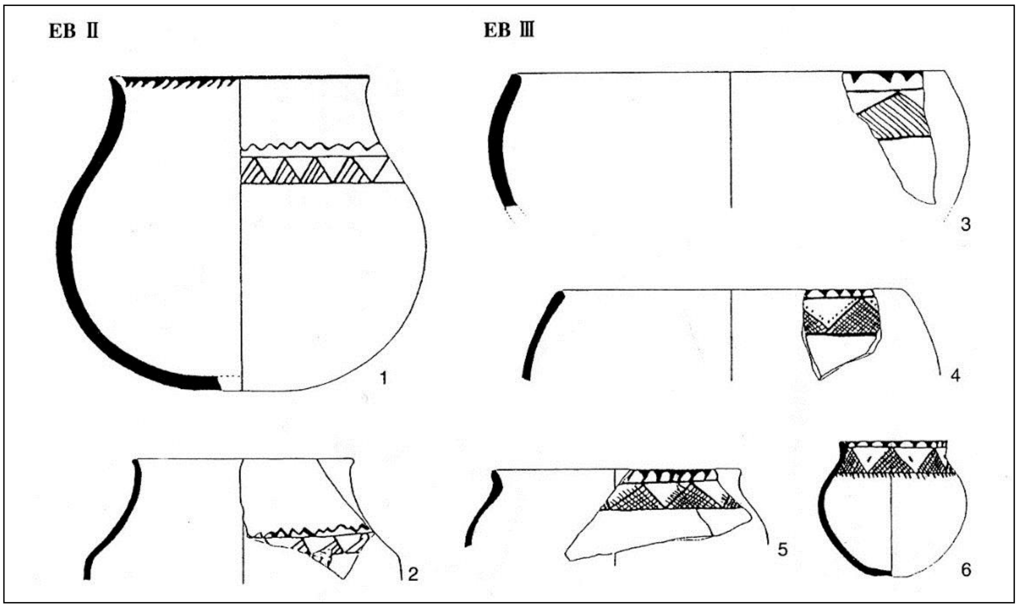

Figure 30. Early Trans Caucasian/Malatya Ealziğ painted pottery from Tepecik (n. 1, 3-5), Pulur (n. 2) and Norşuntepe (n. 6) (*after* Oguchi 2001, fig. 6).

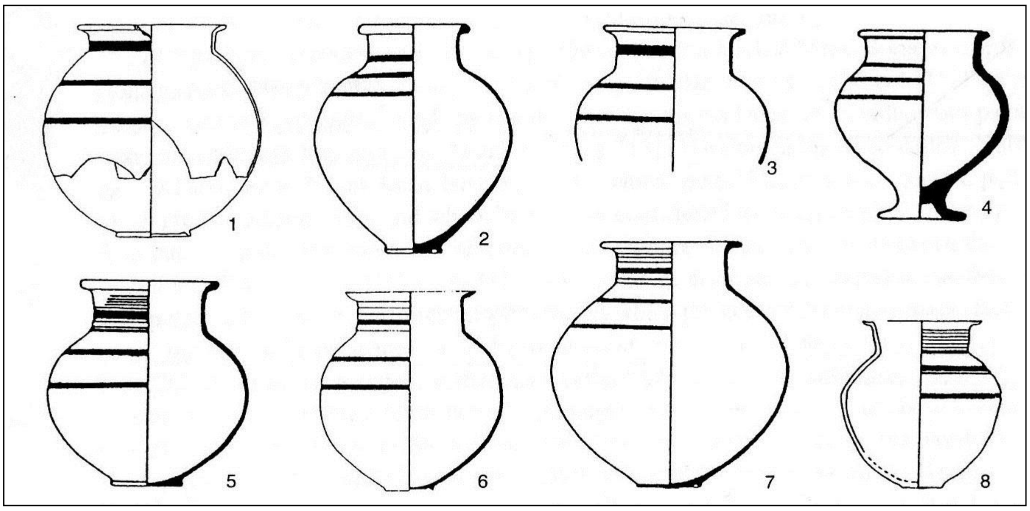

Figure 31. 3rd millennium band-painted pottery distributed along the Middle Euphrates and coming from Tell Jidle (n. 1), Tell Hadidi (n. 2-3, 5 and 7), Til Barsip (n. 4), Terqa (n. 6) and Abu Salabikh (n. 8) (*after* Oguchi 2001, fig. 4).

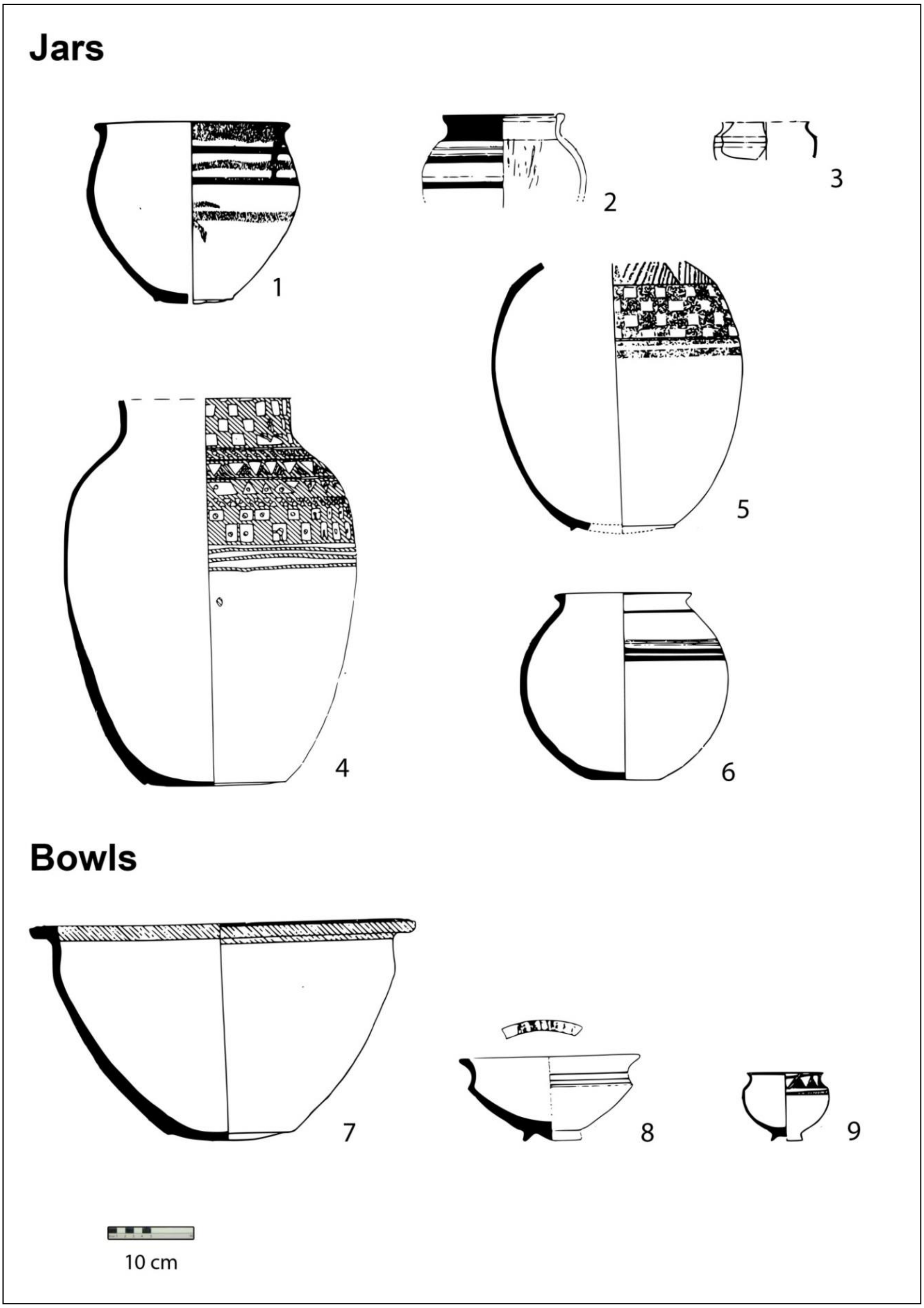

Figure 32. Khabur ware (phase I).

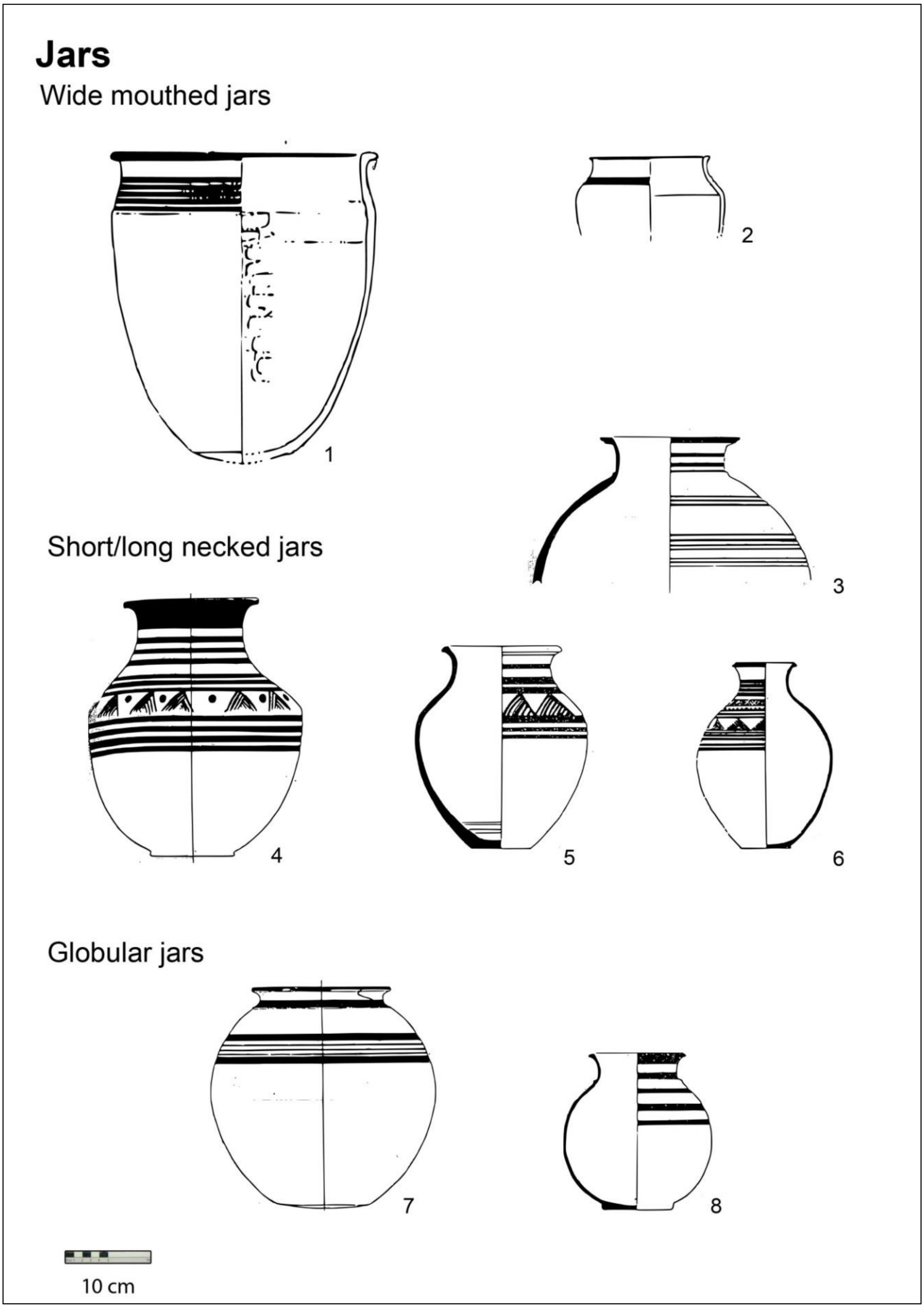

Figure 33. Khabur ware (phase II).

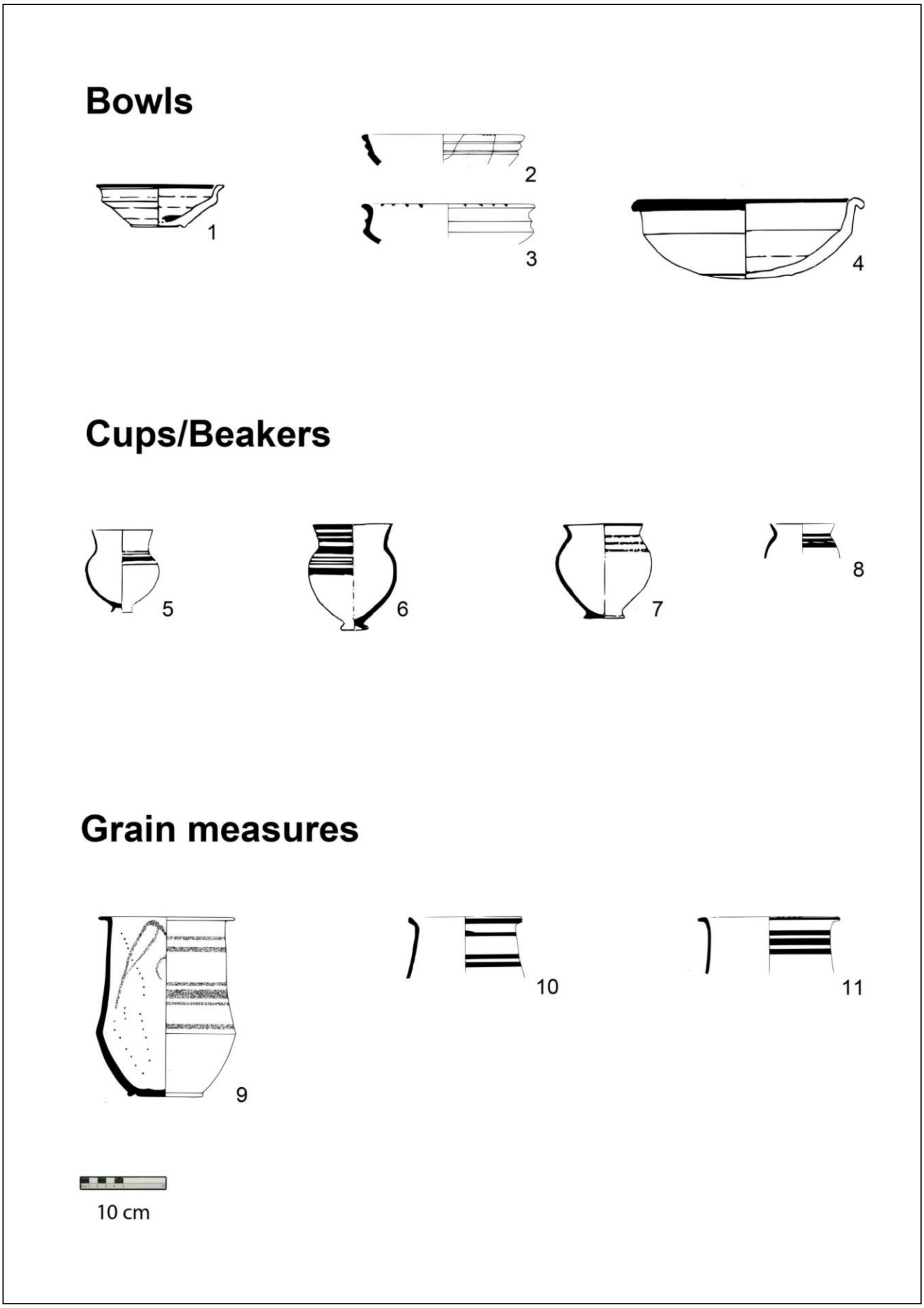

Figure 34. Khabur ware (phase II).

Figure 35. Long – necked jars from Chagar Bazar.

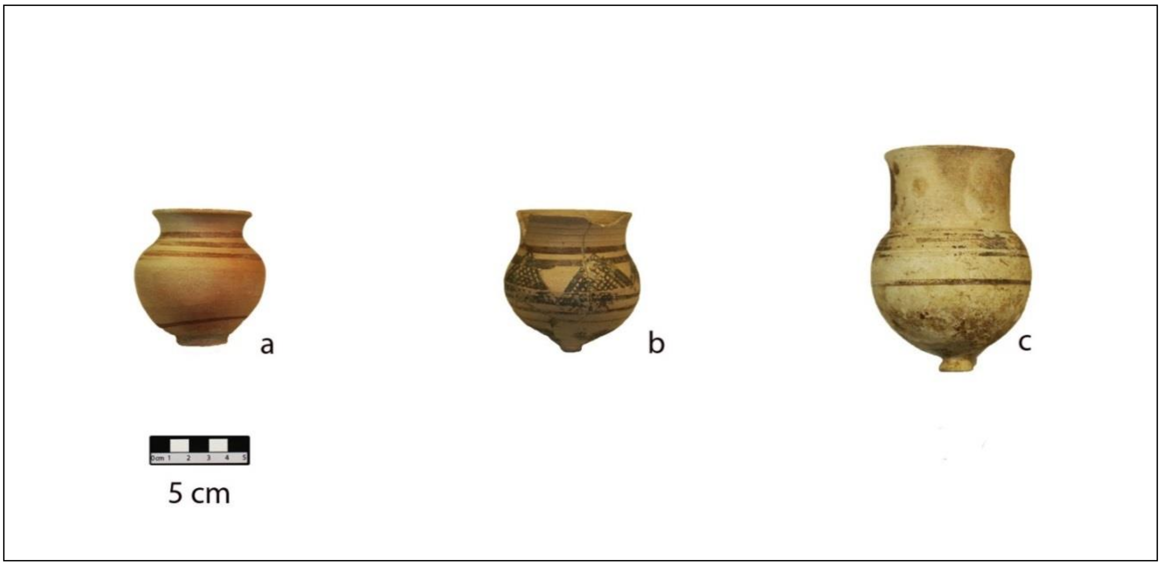

Figure 36.. Khabur ware, cups/beakers.

Figure 37. One carinated bowl (a) and one “Grain measure” (b).

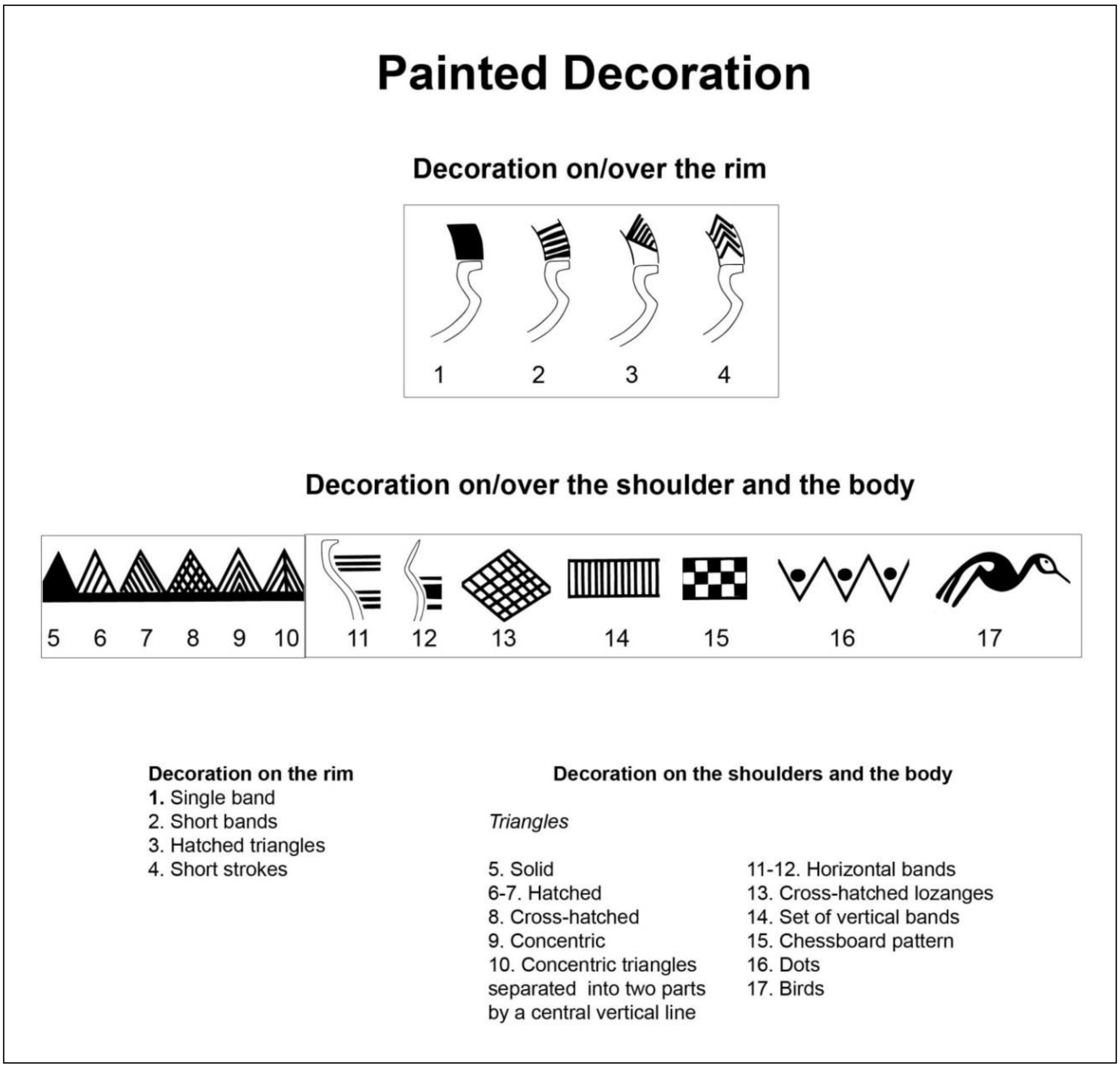

Figure 38. Khabur ware painted decorations (Modified from Faivre and Nicolle 2007).

References to the illustration on fig. 32

1. Oates 1970, Pl. IX: 2. Tell al-Rimah, area AS.
2. Oguchi 1997a, Pl. II-2: 8-9. Tell Jigan, area C.
3. Buccellati and Kelly-Buccellati 1988, Fig. 26: M1 83. Tell Mozan, area P locus 1.
4. Reade 1968, Pl. LXXXVII: 27. Tell Taya, level IV.
5. Oates 1970, Pl. IX: 1. Tell al-Rimah, area AS.
6. Mallowan 1936, Fig. 16:3. Chagar Bazar, level 1 (grave 3).
7. Reade 1968, Pl. LXXXVII: 28. Tell Taya, level IV.
8. Oates 1970, Pl. IX: 3. Tell al-Rimah, area AS.
9. Reade 1968, Pl. LXXXVII: 26. Tell Taya, level IV.

References to the illustration on fig. 33

1. Fuji *et al.* 1989-90, Fig. 7:12. Tell Thuwaij.
2. Numoto 1988, Fig. 25:225. Tell Fisna.
3. Faivre 1992, Fig. 7:4. Tell Mohammed Diyab, phase 5.
4. Mallowan 1937, Fig. 21:12. Chagar Bazar, level 1 phase B (grave 141).
5. Faivre 1992, Fig. 10:2. Tell Mohammed Diyab, phase 5.
6. Speiser 1933, Pl. LIX:4. Tell Billa, stratum 4 (tomb 61).
7. Mallowan 1937, Fig. 22:14. Chagar Bazar, level 1 phase B (grave 135).
8. Faivre 1992. Fig. 10:7. Tell Mohammed Diyab, phase 5.

References to the illustration on fig. 34

1. Oguchi 1997a, Pl. II-16: 8. Tell Jigan.
2. Oates *et al.* 1997, Fig. 190: 238. Tell Brak.
3. Oates *et al.* 1997, Fig. 190: 241. Tell Brak.
4. Fuji *et al.* 1989-90, Fig. 7:14. Tell Thuwaij.
5. Weiss 1985, p. 13. Tell Leilan.
6. T. Özgüç 1953, Abb. 25. Kültepe.
7. T. Özgüç 1953, Abb. 26. Kültepe.

8. Oates *et al.* 1997, Fig. 195: 350. Tell Brak, level 9.

9. Postgate 1997 *et al.*, Fig. 870. Tell al-Rimah.

10. Oates *et al.* 1997, Fig. 191: 259.Tell Brak.

11. Oates *et al.* 1997, Fig. 191: 265.Tell Brak.

References to the illustration on fig. 35

a. Unpublished vessel n. 1936.1216.3, British Museum. Chagar Bazar.

b. Unpublished vessel n. 1935.1207.1, British Museum. Chagar Bazar (grave 3).

References to the illustration on fig. 36

a. Stein 1940, p. 338. Hasanlu.

b. Unpublished vessel n. 1939.0209.70, British Museum. Chagar Bazar (grave 93).

c. Unpublished vessel n. 1922.0812.6., British Museum. Ashur.

References to the illustration on fig. 37

a. Unpublished vessel n. 1936.1216.44, British Museum. Chagar Bazar.

b. Unpublished vessel n. 1936.1216.12, British Museum. Chagar Bazar.

<table>
<tr><th>Phase</th><th>Shape</th><th>Painted Decoration</th><th>Unpainted decoration</th></tr>
<tr><td rowspan="2">Khabur Ware I</td><td>Jars
Wide mouthed jars</td><td>• Horizontal bands
• Oblique bands
• Cross-hatched triangles
• Chessboard pattern
• Solid triangles
• Dotted circles
• Dots
• Paint on the rim</td><td>• Combed horizontal bands
• Horizontal grooves
• Grooves on the rim
• Grooves on the shoulder
• Ribbed bands</td></tr>
<tr><td>Bowls</td><td>• Horizontal bands
• Cross-hatched triangles
• Solid triangles
• Strokes on the rim
• Cross-hatching on the rim</td><td>• A ribbed band
• Grooves on the rim</td></tr>
<tr><td rowspan="4">Khabur Ware II</td><td>Jars
Wide mouthed jars
Short/long necked jars
Globular Jars</td><td>• Horizontal bands
• Oblique bands
• Vertical bands
• Cross-hatched triangles
• Solid triangles
• Dotted circles
• Dots
• Paint on the rim
• Strokes on the rim</td><td>• Combed horizontal bands
• Grooves on the rim
• Ribbed bands</td></tr>
<tr><td>Bowls</td><td>• Horizontal bands
• Cross-hatched triangles
• Solid triangles
• Strokes on the rim
• Cross-hatching on the rim</td><td>• A ribbed band
• Grooves on the rim</td></tr>
<tr><td>Cups/Beakers</td><td>• Horizontal bands
• Paint on the rim
• Hatched triangles</td><td>• Horizontal grooves</td></tr>
<tr><td>Grain measures</td><td>• Horizontal bands
• Oblique bands
• Hatched triangles
• Solid triangles</td><td>• Combed horizontal bands
• Horizontal grooves</td></tr>
</table>

Figure 39. Vessel shapes and decoration (phases 1-2).

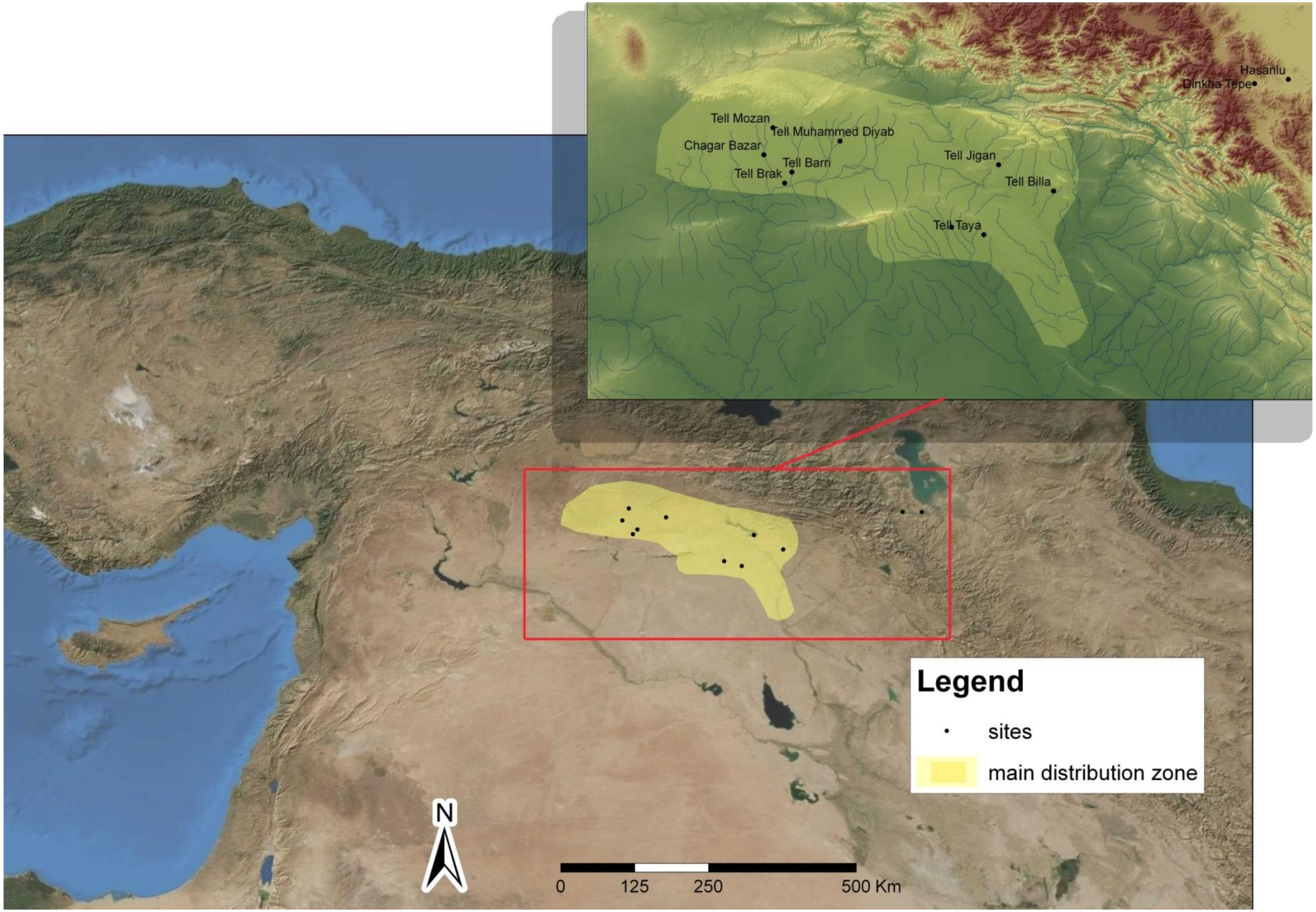

Figure 40. Distrubution of Khabur ware period I (*ca.* 2000-1800 BC).

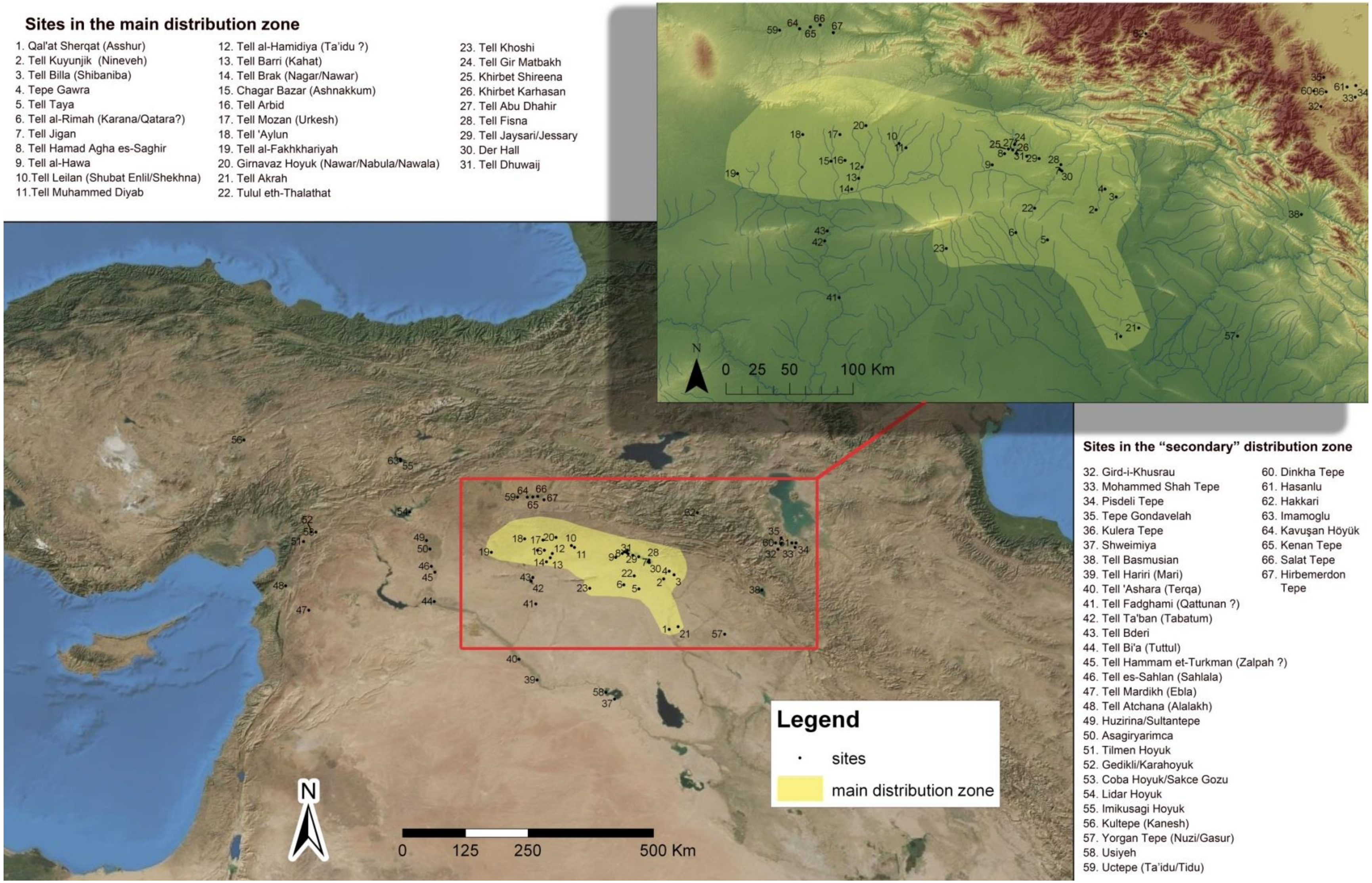

Figure 41. Distribution of Khabur ware period II (ca. 1800-1750/30 BC).

Site	Map no.	Area	No. items	References
Main distribution zone				
Northern Iraq				
Qal'at Sharqat (Aššur)	1	'Afar Plain	68	Hrouda 1957, 22-27, 57-64; Taf. 8-10. Haller 1954, Taf. 1. Dittmann 1990, 161. One unpublished beaker from The British Museum.
Tell Kuyunkik (Nineveh)	2	'Afar Plain	11	Reade 2005, 370.
Tell Billa (Shibaniba)	3	'Afar Plain	5	Speiser 1933, Pl. LIX, Pl. LXXII.
Tepe Gawra	4	'Afar Plain	1	Speiser 1935, Pl. LXXI: 157.
Tell Taya	5	'Afar Plain	1	Reade 1968, Pl. LXXXVII: 29.
Tell al-Rimah (Karana/Qatara?)	6	'Afar Plain	100	Postgate et al. 1997, 52-54;Pl.19,58,74,75,78,79,90,91.
Tell Akrah	21	'Afar Plain	1	el-Amin and Mallowan 1950, Pl. IX: 7.
Tulu eth-Thalathat	22	'Afar Plain	1	Fukai and Matsutani 1977, Fig. 6:1.
Tell Khoshi*	23	'Afar Plain	?	Oguchi 1997b, 212.
Tell Jigan	7	Upper Tigris	77	Wilhelm and Zaccagnini 1993, p.258, 269-70; Pl.LXVII-LXVIII: 1-20. Kawamata *et al.* 1987, 186. Fuji *et al.* 1987, fig. 4. Fuji 1987, fig. 5. Oguchi 1997a, pl. II-2; pl. II-9; II-4; II-10.
Tell Hamad Agha es-Saghir	8	Upper Tigris	29	Spanos 1988, 89. Spanos 1990, Fig. 12, 14-17.
Der Hall	30	Upper Tigris	11	Oguchi 1997a, pl. II-5; II-11; II-18.
Tell Fisna	28	Upper Tigris	27	Numoto 1988, Fig. 25-28. Oguchi 1997a, pl. II-6; II-12; II-19.
Tell Jaysary/Jessary	29	Upper Tigris	19	Numoto 1990, Fig. 2: 50, 52, 53, 55. Fig. 6: 117-121. Oguchi 1997a, pl. II-7; II-12; II-20.
Tell Dhuwaij	31	Upper Tigris	28	Oguchi 1997a, pl. II-8; II-13; II-21.
Khirbet Karhasan*	26	Upper Tigris	?	Ball 2003, 101.
Tell Abu Dhahir*	27	Upper Tigris	?	Ball 2007, 71-78.
Khirbet Shireena*	25	Upper Tigris	?	Ball 2003, 36.
Tell Gir Matbakh	24	Upper Tigris	3	Ball 2003, 129.
Tell al-Hawa	9	Northern Jazira	23	Ball et al. 1989, 60 and 66.
North-Eastern Syria				
Tell Leilan (Shubat Enlil/Shekhna)	10	Khabur triangle	221	Ristvet 2005, 299-303. Weiss 1985, 13. Frane 1996, pl. 1-8. Pulhan 2000, 67-149; Appendices: 1-3.
Tell Mohammed Diyab	11	Khabur triangle	94	Faivre 1992, Fig. 7: 4-5, Fig. 8: 1-7, 10-15, Fig. 10: 1-10, Fig. 11: 1, Fig. 12:5, Fig. 14:8. Nicolle 2006, 41, 52, 54, fig. 7.24 -7.27, 7.29. Faivre and Nicolle 2007: pl. X-XI.
Tell al-Hamidiya (Ta'idu?)	12	Khabur triangle	12	Eichler et al. 1985: Taf. 96:

				4004, 1-4, Taf. 97: 4006: 3, 4007: 3-4, Taf. 99: 4010: 5, Taf 101 and taf. 102: 4024.
Tell Barri (Kahat)	13	Khabur triangle	56	Baccelli et al. 2008, Fig. 1, 3-4.
Tell Brak (Nagar/Nawar)	14	Khabur triangle	253	Matthews et al. 1994, 188 and Fig. 15. Matthews 1995, fig. 21. McDonald and Jackson 2003, pp. 288-289, Fig. 7.23-7.31. Oates et al. 1997:,pp.63-66, Fig. 186, 189, 190-193, 195.
Chagar Bazar (Ashnakkum)	15	Khabur triangle	278	Mallowan 1936, fig. 16-17. Mallowan 1937, fig. 21-24. Mallowan 1947, pl. LXXXIII. McMahon 2009, pl. 1, 6-8, 10, 12-13, 18, 19, 24, 30-33, 37-40, 43-50, 54, 56-57, 59-61. 12 unpublished vessels from the British Museum.
Tell Arbid	16	Khabur triangle	13	Mallowan 1937, fig. 21:13. Belinski 2000, 318. Belinski 2002,312. Belinski 2004, fig. 10. One unpublished bowl from the British Museum.
Tell Mozan (Urkeš)	17	Khabur triangle	750	Buccellati and Buccellati 1991, 713. Kelly-Buccellati 1990, 126. Dohman and Pfalzner 2000, fig. 18. Buccellati & Kelly-Buccellati 1988, Fig. 22, Fig. 26: M1 79-82. Schmidt 2013 and Schmidt 2012.
Tell ʼAylun	18	Khabur triangle	4	Moortgat 1959, 19, 24, 30; fig. 16-18.
Tell al-Fakhkhariyah	19	Khabur triangle	15	Kantor 1958, pl. 35-37. Hrouda 1961, 222-223, fig. 16: a, d.
Girnavaz Hoyuk (Nawar/Nabula/Nawala?)	20	Khabur triangle	?	Erkanel 1988.
Total				**2101**
Secondary Distribution Zone				
North-western Iran and Hakkari region				
Gird-i-Khusrau*	32	Ushnu-Solduz valley	?	Kroll 1994, 64
Mohammed Shah Tepe*	33	Ushnu-Solduz valley	?	Oguchi 1997b, 216
Pisdeli Tepe*	34	Ushnu-Solduz valley	?	Hamlin 1971, 196
Tepe Gondavelah*	35	Ushnu-Solduz valley	?	Oguchi 1997b, 216
Kulera Tepe*	36	Ushnu-Solduz valley	?	Oguchi 1997b, 216
Dinkha Tepe	60	Ushnu-Solduz valley	239	Hamlin 1971, Pls. XII-XIII. Hamlin 1974, Figs. XII-XIII.
Hasanlu	61	Ushnu-Solduz valley	4	Dyson 1965, Figs. 1 and 13. 1 beaker from British Museum.

Hakkari	62	Hakkari	16	Ozfirat 2002, Figs. 4-8.
Northern Iraq				
Tell Basmusian	38	Raniya Plain	4	Abu al-Soof 1970, 68-69, pl. XXXIII, 2,3,9,11,13,14.
Yorgan Tepe (Nuzi/Gasur)	57	Kirkuk	2	Starr 1937, pl. 70:B, pl. 75:N.
Middle-Euphrates and Lower Khabur basin				
Shweimiya	37	Middle Euphrates	1	Oguchi 2006, Fig. 2:f.
Tell Hariri (Mari)	39	Middle Euphrates	1	Parrot 1959b, fig. 92: c/Pl. XXXVI: 1584.
Tell ‘Ashara (Terqa)	40	Middle Euphrates	16	Buia 1993, Fig. 195, a, d, f-g on p. 891. Tables 21-25.
Usiyeh	58	Middle Euphrates	1	Agha 1987-88, Fig. 10, p. 118.
Tell Fadghami (Qattunan ?)*	41	Lower Khabur	?	Rollig and Kuhne 1978, 126-127.
Tell Ta’ban (Tabatum)*	42	Lower Khabur	?	Rollig and Kuhne 1978, 126-127.
Tell Bderi	43	Lower Khabur	10	Pfalzner 1995, p. 38, Taf. 52:a, Taf. 66:e, Taf. 66: i. Those potsherds belong to the 14th century's levels.
Balikh valley				
Tell Bi’a (Tuttul)	44	Balikh	3	Strommenger 1991, abb. 5. Einwag 1993, abb. 9: 1,2.
Tell Hammam et-Turkman (Zalpah?)	45	Balikh	21	Curvers 1988, 403-404, Pl. 142: 214-215. UCL collection (19 body sherds).
Tell es-Sahlan (Sahlala)	46	Balikh	1	Mallowan 1946, p.138.
Huzirina/Sultantepe*	49	Balikh	?	Oguchi 1997b, p. 215.
Asagiryarimca*	50	Balikh	?	Oguchi 1997b, p. 215.
North-western Syria and South-eastern Anatolia				
Imikusagi Höyük	55	Elazig	18	Mellink 1988, Fig. 13. Sevin 1984, Pl. 11. Sevin & Koroglu Fig. 12. Sevin 1987, Fig. 22.
Imamoglu	63	Elazig	1	Uzunoglu 1986, Fig. 14.
Tell Mardikh	47	Idlib	2	Matthiae 1977, p. 148.
Lidar Höyük	54	Kurban/Titrish	14	Mellink 1988, Fig. 6. Kaschau 1999, Taf. 134: 3, Taf. 137:1, Taf. 162:7, Taf. 172:1, Taf. 181:5, Taf. 192:3, Taf. 216:1, Taf. 217:3, Taf. 335:2,6, Taf. 345.
Tell Atchana (Alalakh)	48	Amuq	10	Heinz 1992, Taf. 22:37, Taf. 23: 45-46-48. Gates 1981, Ill. 2:o-p; Ill.4:a-b. Woolley 1955, Pl. LXXXVII:ATP/46/286; Pl. XCV:ATP/39/279.
Islahiye-Gaziantep-Nizip region				
Tilmen Höyük*	51	Islahiye	?	Alkım 1969, 286-287
Gedikly/Karahöyük*	52	Gaziantep	?	Duru 2006
Usiyeh	58	Nizip	1	Agha 1987-88, Fig. 10, p. 118.
Central Anatolia				
Kültepe	56	Kayseri	6	Özgüç 1986b, 92-93, Pl. 134:3. Özgüç 1953, Abb. 17/25 and Abb. 18/26. Emre 1963, Pl.

				XXV:1. Hrouda 1989, Fig. 2.
Upper Tigris valley				
Uçtepe (Ta'idu/Tidu)	59	Diyarbakir	11	Özfirat 2005, 53; pl. XC-XCI
Kavuşan Höyük	64	Diyarbakir	13	Kozbe 2007, 582. Kozbe 2010: p.185; fig. 6.
Kenan Tepe	65	Diyarbakir	71	Bradley and Parker 2012
Salat Tepe	66	Diyarbakir	1	Ökse 2010, 325; fig. 5.
Hirbemerdon Tepe	67	Diyarbakir	6	D'Agostino 2012, p. 194.
Total		**473**		

Figure 42. Table showing the sites yielding Khabur Ware in the main and secondary distribution zones. (*) Sites yielding Khabur Ware but that have never had a single piece published.

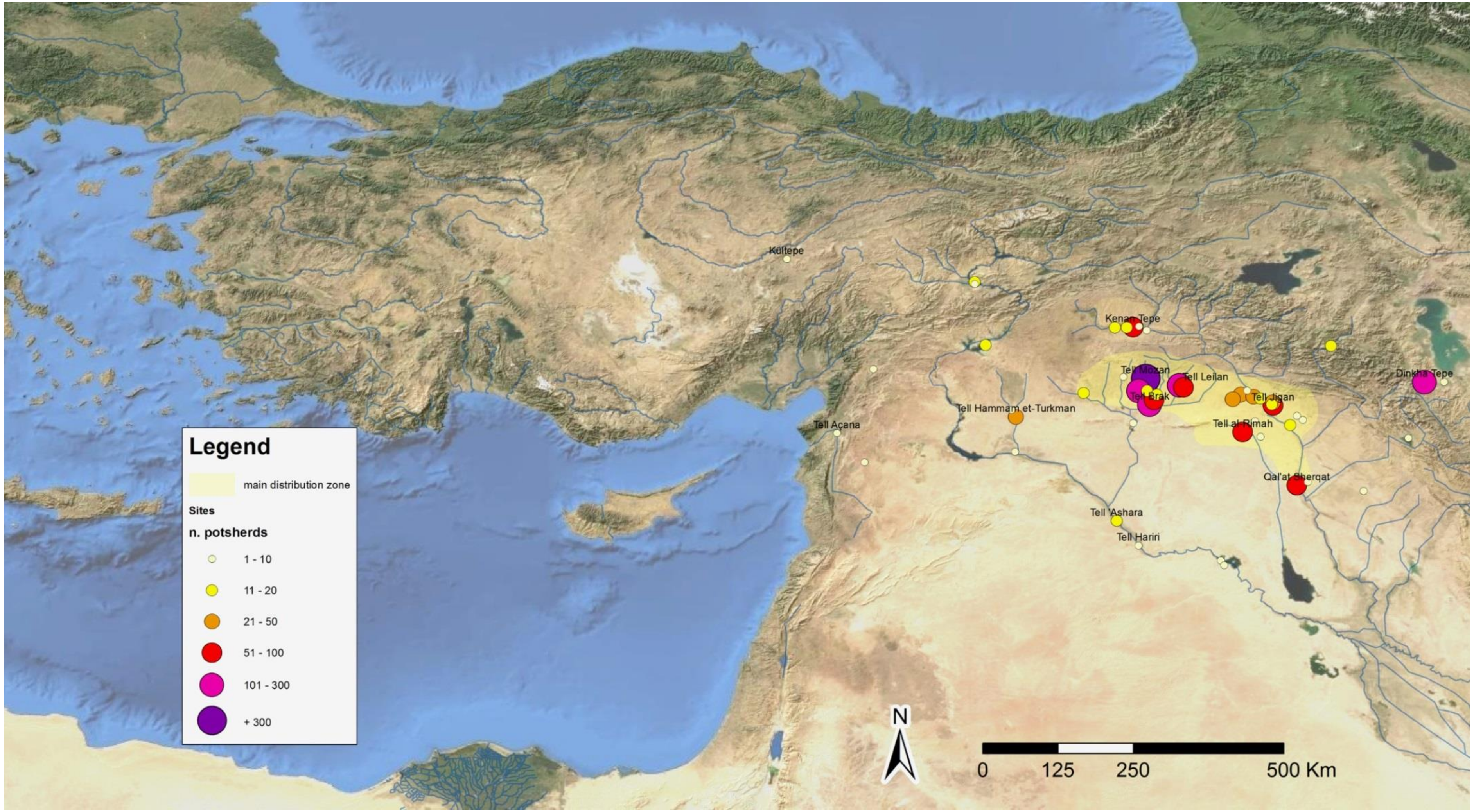

Figure 43. The frequency distribution of Khabur ware (Phase I-II, *ca.* 2000-1750/1730 BC).

Shape	Frequency (No.)	Percentage (%)
Jar (1)	1091	45
Beaker/cup (2)	488	20.1
Bowl (3)	781	32.2
Grain Measure (4)	65	2.7
Total	2425	100

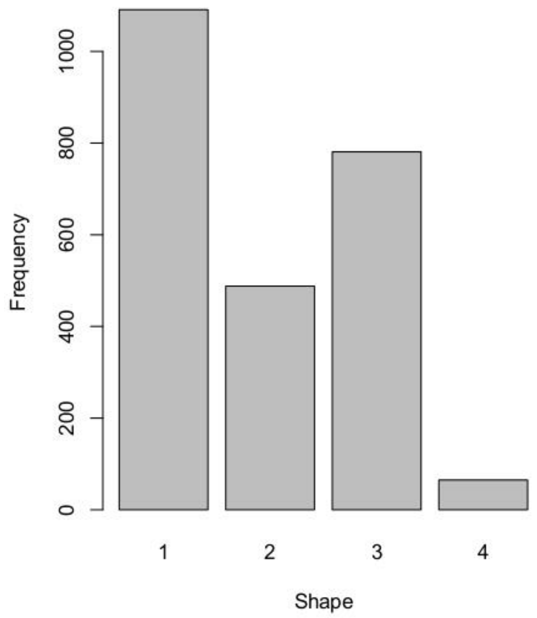

Figure 44. Frequency and percentage of vessel shapes.

Context	Frequency (No.)	Percentage (%)
Domestic (1)	1449	71.3
Funerary (2)	232	11.4
Palatial(3)	205	10.1
Religious (4)	145	7.1
Total	2031	100

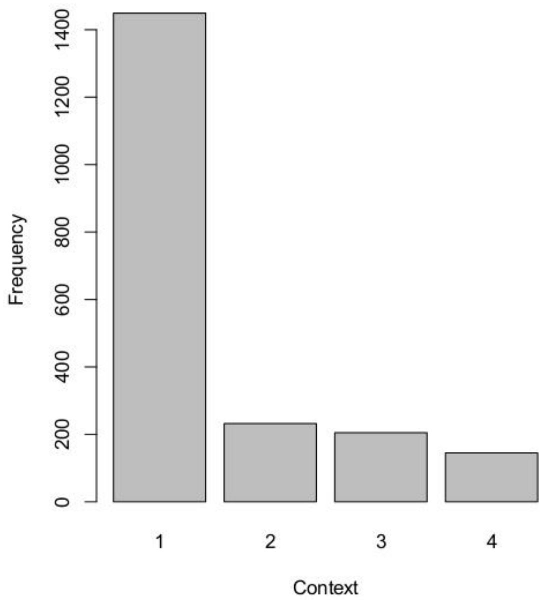

Figure 45. Frequency and percentage of vessels by context.

Shape		Area		
		Main	Secondary	Total
Jar (1)	Count (Percentage)	861 (41.0)	230 (71.0)	1091
Beaker/Cup (2)	Count (Percentage)	467 (22.2)	21 (6.5)	488
Bowl (3)	Count (Percentage)	716 (34.1)	65 (20.1)	781
Grain Measure (4)	Count (Percentage)	57 (2.7)	8 (2.5)	65
Total		2101	324	2425

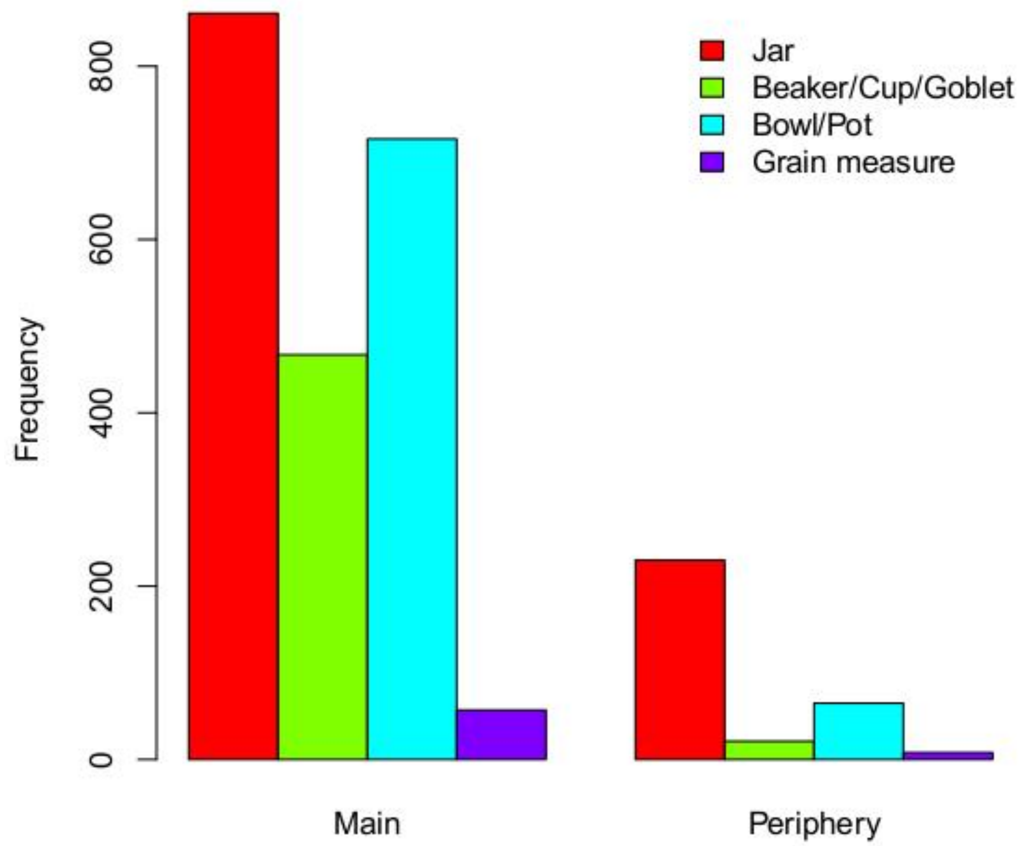

Figure 46. Frequency and percentage of vessel shapes in the main and secondary distribution areas.

Context		Area		
		Main	Secondary	Total
Domestic	Count (Percentage)	1393 (72.3)	56 (53.3)	1449
Funerary	Count (Percentage)	205 (10.6)	27 (25.7)	232
Palatial	Count (Percentage)	191 (9.9)	14 (13.3)	205
Religious	Count (Percentage)	137 (7.1)	8 (7.6)	145
Total		1926	105	2031

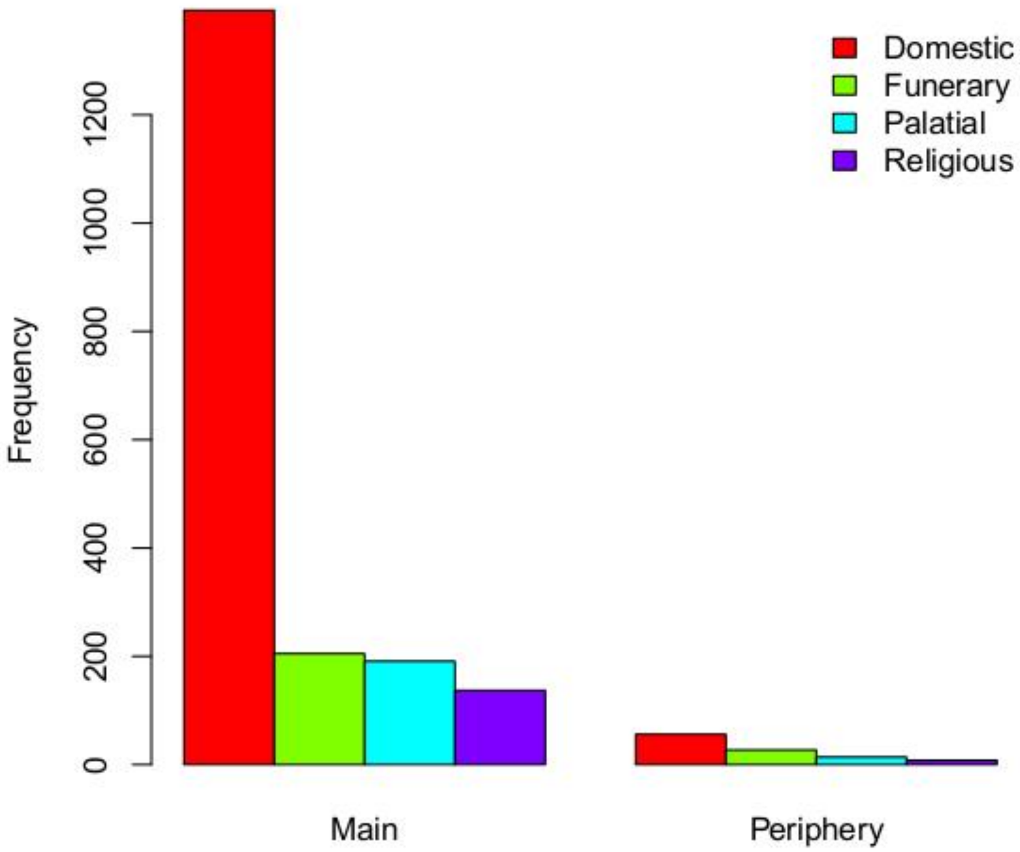

Figure 47. Frequency and percentage of Khabur ware in the main and secondary distribution areas according to the context.

Context		Shape				
		Jar	Beaker	Bowl	Grain Measure	Total
Domestic	Count (Percantage)	652 (78.1)	219 (47.6)	531 (79.1)	47 (72.3)	1449
Funerary	Count (Percentage)	88 (10.5)	101 (22.0)	42 (6.3)	1 (1.5)	232
Palatial	Count (Percentage)	61 (7.3)	65 (14.1)	62 (9.2)	17 (26.2)	205
Religious	Count (Percentage)	34 (4.1)	75 (16.3)	36 (5.4)	0 (0)	145
Total 2031		835	460	671	65	

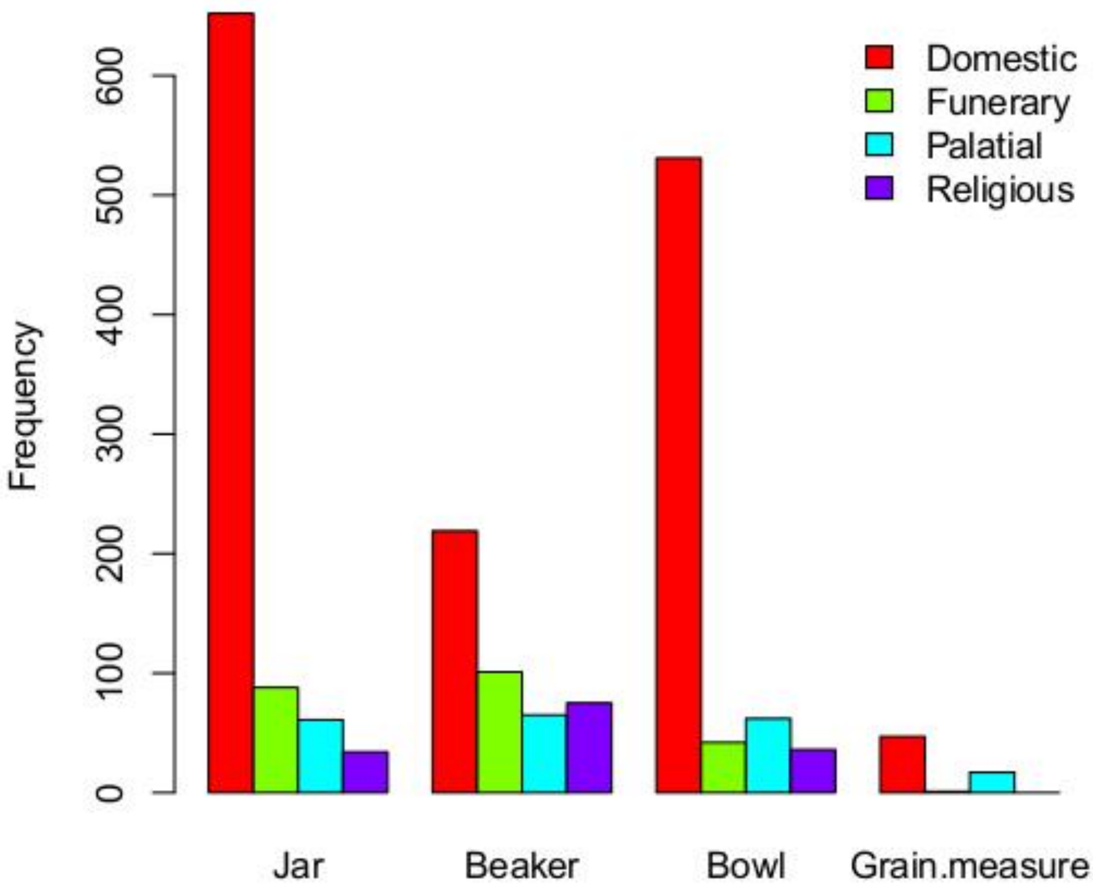

Figure 48. Frequency and percentage of vessel shapes in each context.

Shape		Context				
		Domestic	Funerary	Palatial	Religious	Total
Jar	Count (Expected Count)	652 (597.5)	88 (95.4)	61 (84.3)	34 (59.6)	835
Beaker	Count (Expected Count)	219 (328.2)	101 (52.5)	65 (46.4)	75 (32.8)	460
Bowl	Count (Expected Count)	531 (478.7)	42 (76.6)	62 (67.7)	36 (47.9)	671
Grain Measure	Count (Expected Count)	47 (46.4)	1 (7.4)	17 (6.6)	0 (4.6)	65
Total		1449	232	205	145	2031

[X-squared = 217.511, df = 9, **p-value < 0.001]**

Figure 49. Cross-tabulation of “Shape” and “Context” variables. with the most informative differences highlighted in yellow.

Context		Area		
		Main	Secondary	Total
Domestic	Count (Expected Count)	1393 (1374.1)	56 (74.9)	1449
Funerary	Count (Expected Count)	205 (220)	27 (12)	232
Palatial	Count (Expected Count)	191 (194.4)	14 (10.6)	205
Religious	Count (Expected Count)	137 (137.5)	8 (7.5)	145
Total		1926	105	2031

[X-squared = 26.0191, df = 3, **p-value < 0.001**]

Figure 50. Cross-tabulation of “Context” and “Areas” variables. with the most informative differences highlighted in yellow

Shape		Area		
		Main	Secondary	Total
Jar	Count (Expected Count)	861 (945.2)	230 (145.8)	1091
Beaker	Count (Expected Count)	467 (422.8)	21 (65.2)	488
Bowl	Count (Expected Count)	716 (676.7)	65 (104.3)	781
Grain Measure	Count (Expected Count)	57 (56.3)	8 (8.7)	65
Total		2101	324	2425

[X-squared = 107.9553, df = 3, **p-value < 0.001**]

Figure 51. Cross-tabulation of “Shape” and “Areas” variables. with the most informative differences highlighted in yellow.

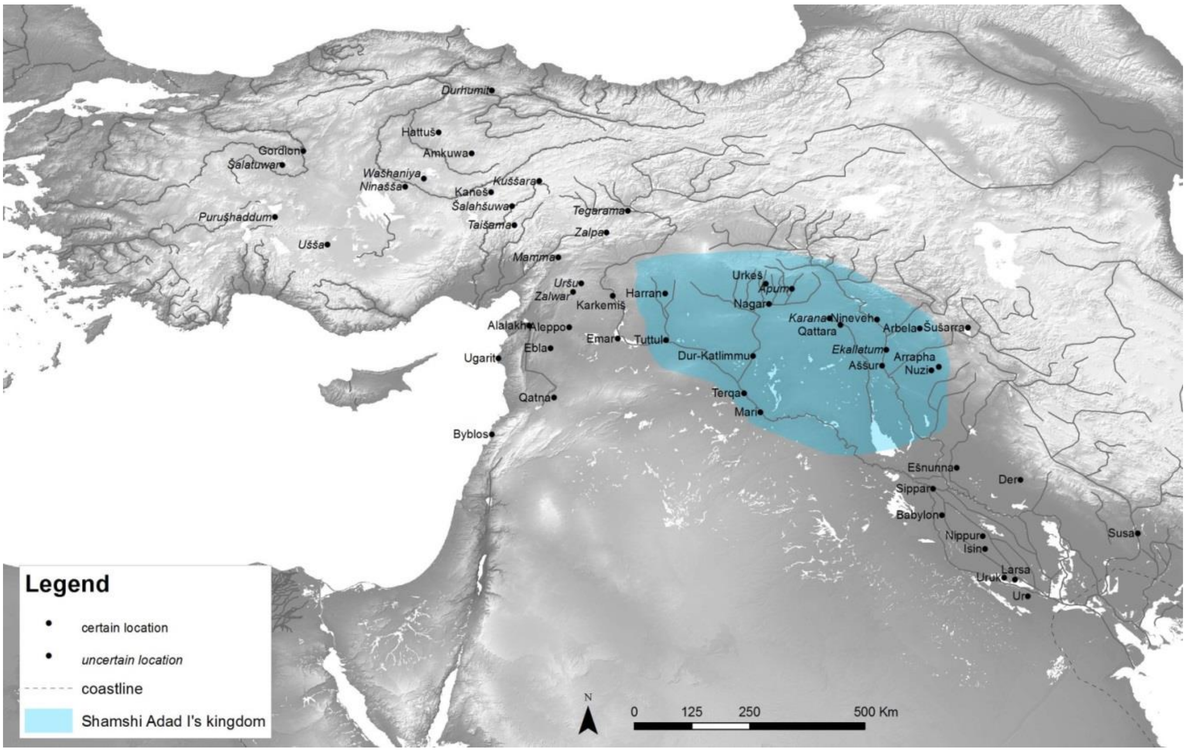

Figure 52. Presumed extent of Šamši-Adad I’s kingdom.

Source	Anatolian	Levantine	Mesopotamian	Syrian	Aegean
Archi 87	11.75	9.4	8.55	7.83	65.8
Ascalone – Peyronel 2006	11.75	9.4	8.4	7.83	6.71
Cour-Marty 90		8.8-9.8	7-9-8.8		
Courtois 90	11.2-11.8	9-9.9	8-8.5	7.83	61.25-64
Eran 96			8.18-8.41		
Heltzer 96	11.75	9.1-9.4	8	7.8-7.9	
Hemmy 35			8.22		
Liverani 72	11.75	9.4		7.83	
Mederos-Karlowsky 04	11.75	9.4	8.55	7.83	65.8
Parise 81	11.75	9.4		7.83	
Parise 86	11.75	9.4		7.83	65.27
Parise 91	11.75	9.4	8.42	7.83	65.27
Petruso 92					61
Powell 79			8.13-8.6		
Powell 90			8.33		
Rahmstorf 2010	11.75	9.4	8.54	7.83	
Roaf 82		9.7			
Segre 28			8.37		65
Weigall 08		8.8-10			
Zaccagnini 86		9.4	8.42	7.9	6.5-6.8
Zaccagnini 91	11.75	9.4	8.5	7.83	6.5-6.8

Figure 53. Current proposals about the weight systems in grams between the third and first millennia BC in the Near East.

Unit	Anatolian	Levantine	Mesopotamian	Syrian	Aegean
Shekel (g)	11.75	9.4	8.55	7.83	6.71
Mina (g)	470 (11.75 x 40)	470 (9.4 x 50)	513 (8.55 x 60)	470 (8.55 x 60)	470 (6.71 x 70)
Talent (g)	28,200 (11.75 x 2,400)	28,200 (9.4 x 3,000)	30,800 (8.55 x 3,600)	28,200 (7.83 x 3,600)	28,200 (6.71 x 4,200)

Figure 54. Weight systems between the third and first millennia BC in the Near East.

unit	Anatolian	Levantine	Mesopotamian	Syrian	Aegean
1 x	11.75	9.4	8.54	7.83	6.71
2 x	23.5	18.8	17.09	15.67	13.42
3 x	35.25	28.2	25.63	23.5	20.13
4 x	**47**	37.6	34.18	31.33	26.84
5 x	58.75	**47**	42.72	39.16	33.55
6 x	70.5	56.4	51.27	**47**	40.26
7 x	82.25	65.8	59.81	54.83	**47**
8 x	**94**	75.2	68.36	62.67	53.71
9 x	105.75	84.6	76.90	70.5	60.42
10 x	117.5	**94**	85.45	78.33	67.13
11 x	129.25	103.4	**94**	86.16	73.84
12 x	**141**	112.8	102.54	**94**	80.55
14 x	164.5	131.6	119.63	109.67	**94**
15 x	176.25	**141**	128.18	117.5	100.65
16 x	**188**	150.6	136.72	125.33	107.36
18 x	211.5	169.2	153.81	**141**	120.78
20 x	**235**	**188**	170.90	156.67	134.2
21 x	246.75	197.4	179.42	164.5	**141**
22 x	258.5	206.8	**188**	172.33	147.62
24 x	**282**	225.6	205.09	**188**	161
25 x	293.75	**235**	213.63	195.83	167.75
28 x	329	263.2	239.4	219.24	**188**
30 x	352.5	**282**	256.36	**235**	201.3
32 x	**376**	300.8	273.45	250.66	214.72
33 x	387.75	310.2	**282**	258.5	221.43
35 x	411.25	329	299.25	274	**235**
36 x	423	338.4	307.63	**282**	241.56
40 x	**470**	**376**	341.81	313.33	268.4
42 x	493.5	394.8	359	328.86	**282**
44 x	517	413.6	**376**	344.66	295.24
48 x	**564**	451.2	410.18	**376**	322
49 x	575.75	460.6	419	383.67	329
50 x	587.5	**470**	427.27	391.66	335.5
55 x	646.25	517	**470**	430.83	369
56 x	658	526.4	478.8	438.48	**376**
60 x	705	**564**	**513**	**470**	402.6
70 x	822.5	658	598.5	548	**470**

Figure 55. Multiples and common denominators of basic units of the Near Eastern weight systems.

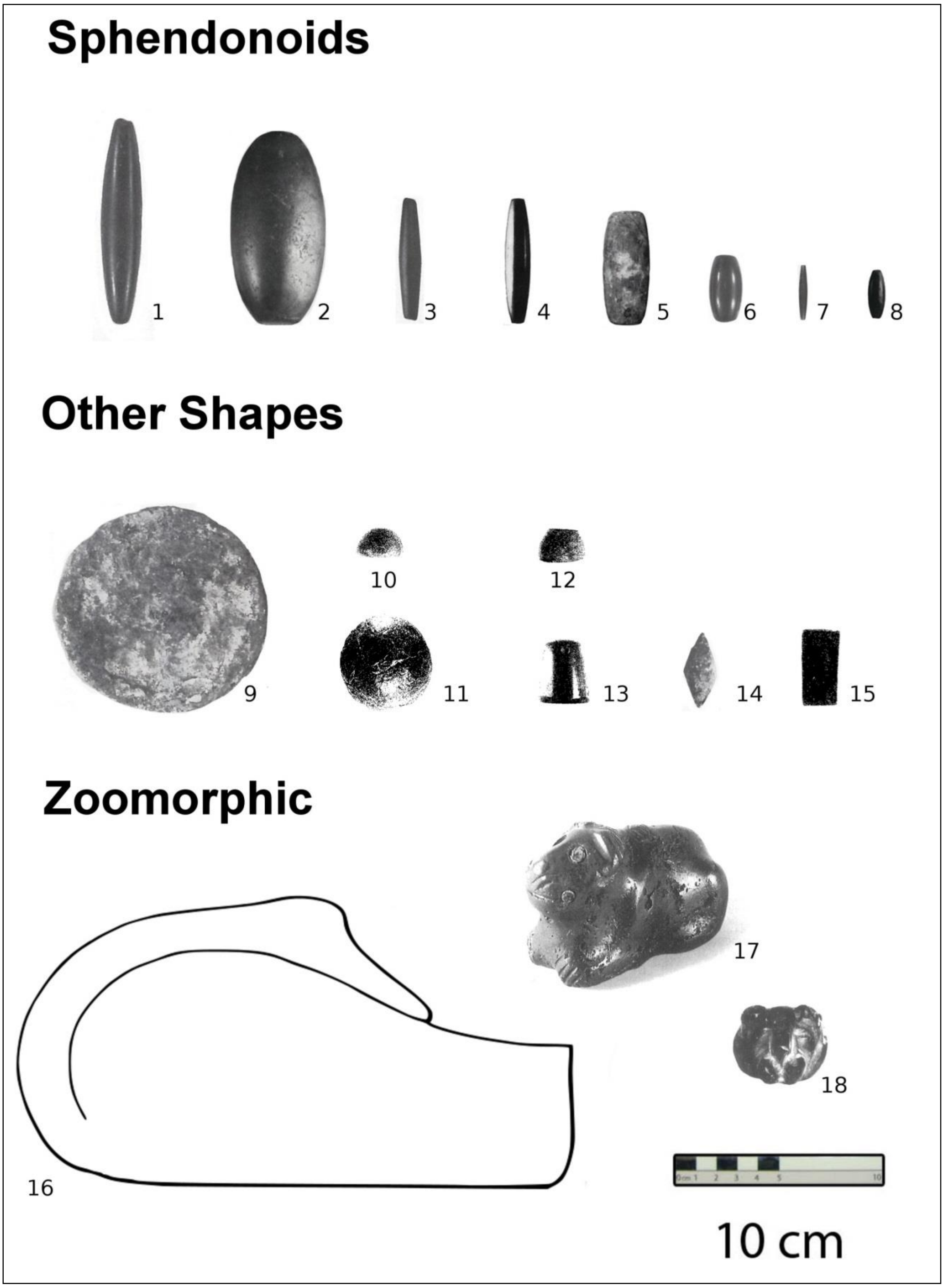

Figure 56. Typologies of balance weights in the Ancient Near East.

References to the illustration on Fig. 56

1. Özgüç, T., 1986, Pl. 131:20. Kültepe, level Ib.

2. Boehmer, R., 1972, Pl. LXXXIV:2196. Böğazköy.

3. Özgüç, T., 1986, Pl. 131:41. Kültepe, level Ib.

4. Boehmer, R., 1972, Pl. LXXXIV:2199. Böğazköy.

5. Boehmer, R., 1972, Pl. LXXXIV:2200. Böğazköy.

6. Özgüç, T., 1986, Pl. 131:23. Kültepe, level Ib.

7. Özgüç, T., 1986, Pl. 131:25. Kültepe, level Ib.

8. Boehmer, R., 1972, Pl. LXXXIV:2198. Böğazköy.

9. Özgüç, T., 1986, Pl. 130:4. Kültepe, level Ib.

10. Ascalone and Peyronel 2006b, Pl. LVII: 189. Tell Mardikh.

11. Ascalone and Peyronel 2006b, Pl. XLVII: 153. Tell Mardikh.

12. Ascalone and Peyronel 2006b, Pl. LX: 196. Tell Mardikh.

13. Ascalone and Peyronel 2006b, Pl. LX: 197. Tell Mardikh.

14. Özgüç, T., 1986, Pl. 130:4. Kültepe, level Ib.

15. Ascalone and Peyronel 2006b, Pl. LXI: 201. Tell Mardikh.

16. Parrot 1959, fig. 63. Tell Hariri.

17. Ascalone and Peyronel 2006b, Pl. LXVIII:240 Tell Mardikh.

18. Mazzoni, S., 1980, fig. 28a. Tell Atchana.

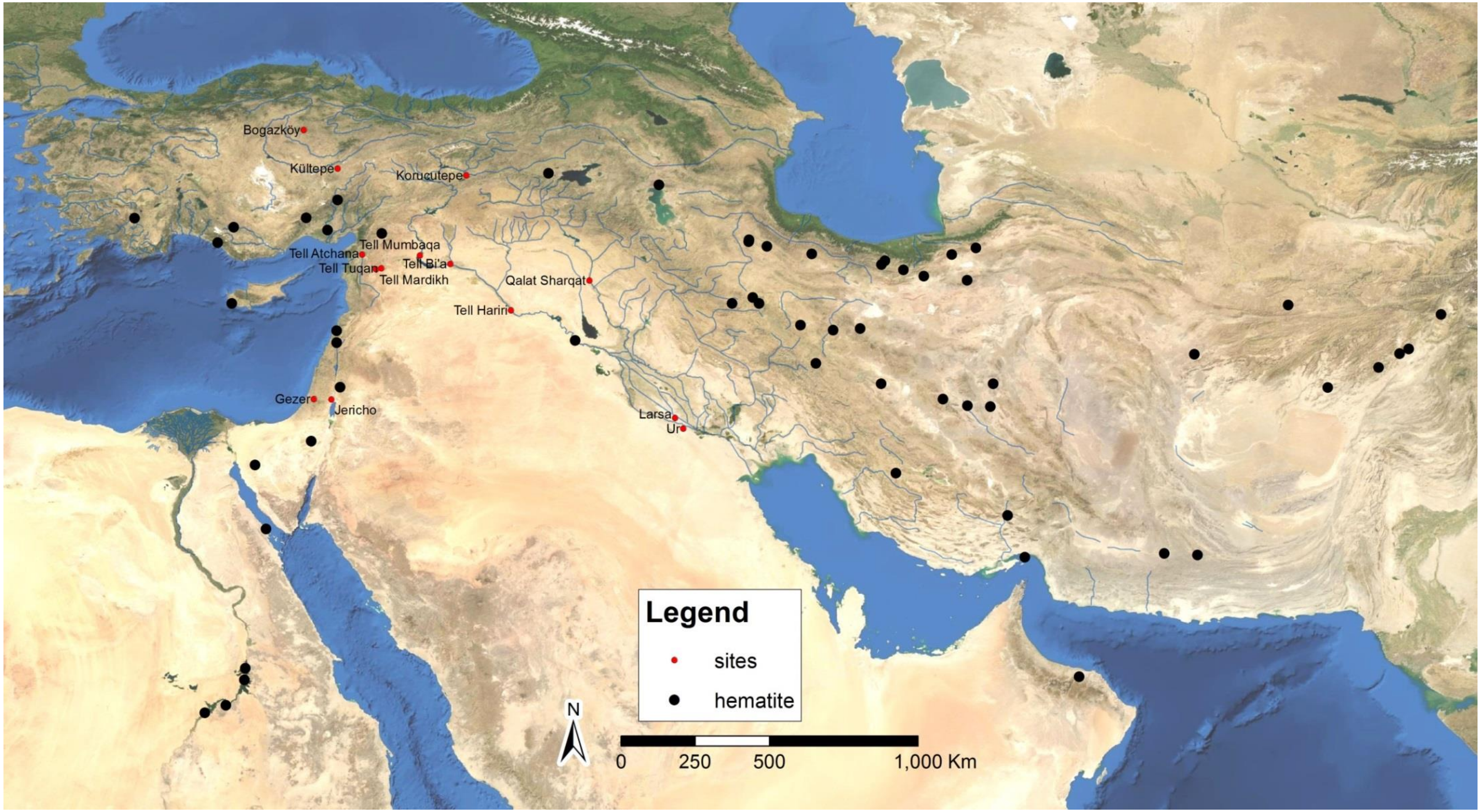

Figure 57. Spatial distribution of deposits of hematite and sites yielding balance weights in hematite during the Middle Bronze Age (ca. 2000-1600 BC).

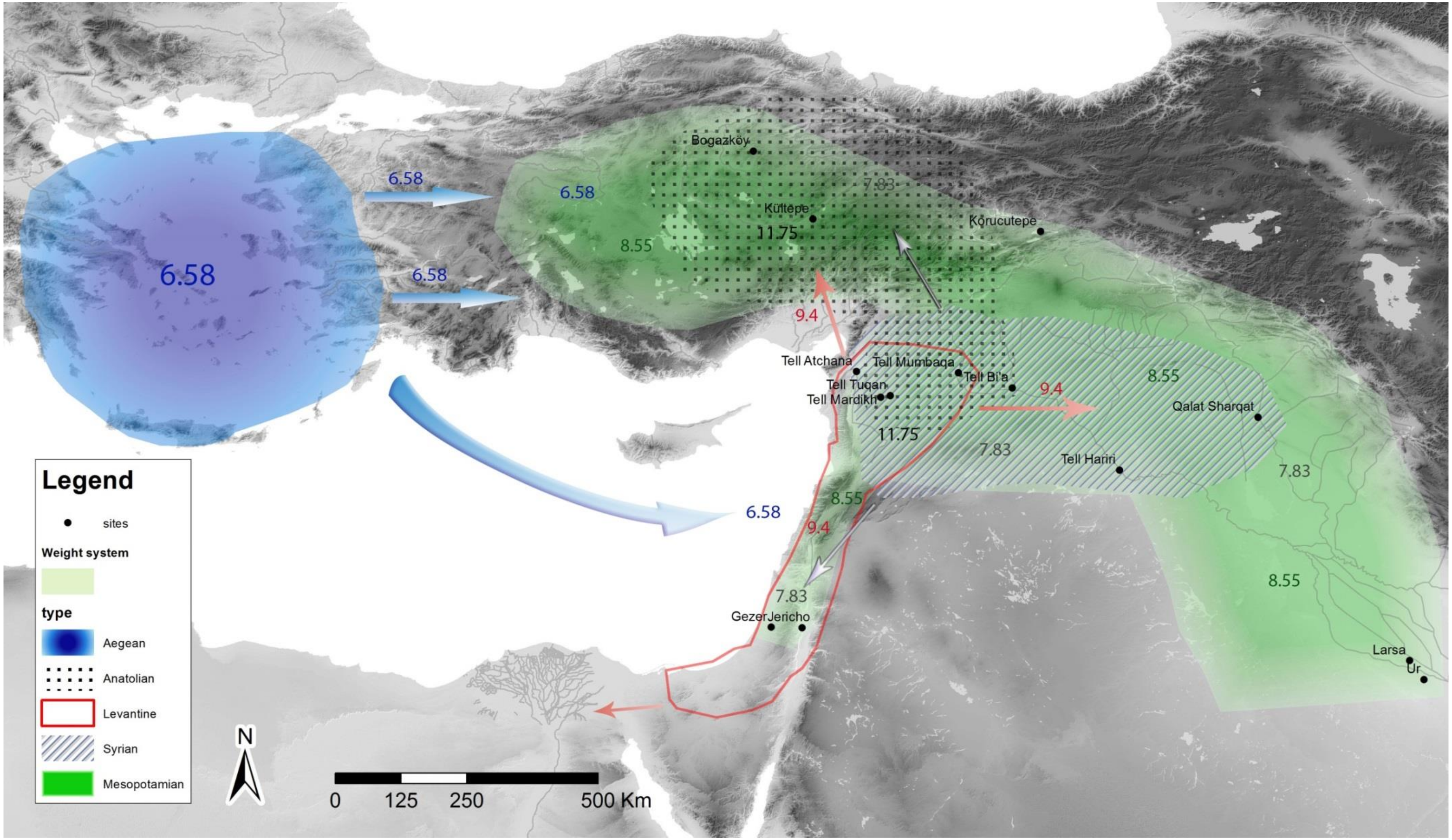

Figure 58. Spatial distribution of weight systems during the Middle Bronze Age (ca. 2000-1700 BC).

Materials	Frequency	Percentage
alabaster	8	2.1
basalt	29	7.7
black stone	2	0.5
brown stone	4	1.1
carnelian	1	0.3
chalk	3	0.8
diorite	3	0.8
gabbro	1	0.3
granite	1	0.3
grey stone	8	2.1
hematite	209	55.6
lead	14	3.7
limestone	57	15.2
magnesite	2	0.5
marble	3	0.8
onyx	1	0.3
pyrite	2	0.5
quartzite	6	1.6
rubble	1	0.3
schist	2	0.5
serpentine	3	0.8
steatite	3	0.8
stone	10	2.7
unstratified	3	0.8
Total	376	100.0

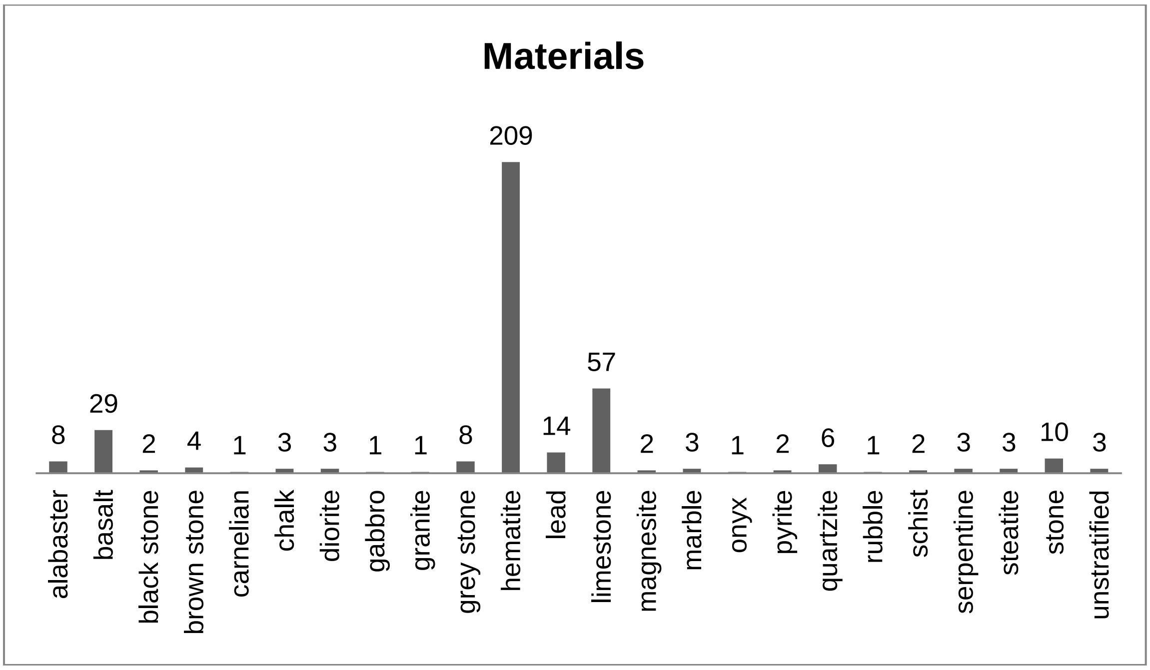

Figure 59. Frequency and percentage of balance weights according to the material.

Materials		Zones			
		Anatolia	Syria	North Mesopotamia (Aššur)	Total
alabaster	Count (expected count)	0 (2.3)	1 (4.5)	7 (1.2)	8
basalt	Count (expected count)	0 (8.3)	21 (16.5)	8 (4.2)	29
black stone	Count (expected count)	0 (0.6)	2 (1,1)	0 (0.3)	2
brown stone	Count (expected count)	0 (1.1)	4 (2.3)	0 (0.6)	4
carnelian	Count (expected count)	0 (0.3)	1 (0.6)	0 (0.1)	1
chalk	Count (expected count)	0 (0.9)	0 (1.7)	3 (0.4)	3
diorite	Count (expected count)	0 (0.9)	0 (1.7)	3 (0.4)	3
gabbro	Count (expected count)	0 (0.3)	1 (0.6)	0 (0.1)	1
granite	Count (expected count)	0 (0.3)	1 (0.6)	0 (0.1)	1
grey stone	Count (expected count)	0 (2.3)	8 (4.5)	0 (1.2)	8
hematite	Count (expected count)	80 (60)	122 (118.8)	7 (30.3)	209
lead	Count (expected count)	14 (4)	0 (8)	0 (2)	14
limestone	Count (expected count)	0 16.4	39 (32.4)	18 (8.3)	57
magnesite	Count (expected count)	0 (0.6)	0 (1.1)	2 (0.3)	2
marble	Count (expected count)	1 (0.9)	0 (1.7)	2 (0.4)	3
onyx	Count (expected count)	0 (0.3)	0 (0.6)	1 (0.1)	1
pyrite	Count (expected count)	0 (0.6)	2 (1.1)	0 (0.3)	2
quartzite	Count (expected count)	2 (1.7)	3 (3.4)	1 (0.9)	6
rubble	Count (expected count)	0 (0.3)	1 (0.6)	0 (0.1)	1
schist	Count (expected count)	0 (0.6)	0 (1.1)	2 (0.3)	2
serpentine	Count (expected count)	0 (0.9)	3 (1.7)	0 (0.4)	3
steatite	Count (expected count)	0 (0.9)	3 (1.7)	0 (0.4)	3
stone	Count (expected count)	10 (2.9)	0 (5.7)	0 (1.4)	10
Total		**107**	**212**	**54**	**373**

X-squared = 253.2819, df = 44, p-value < 2.2e-16

Figure 60. Cross-tabulation of “Materials” and “Zone” variables. In yellow the most informative evidence.

Shape	Frequency	Percentage
biconical	2	0.5
bovine head	1	0.3
conical	1	0.3
cylinder	24	6.4
disc-shaped	7	1.9
domed-shaped	11	2.9
duck	23	6.1
frog	1	0.3
hemisphere	12	3.2
irregular	6	1.6
lion	2	0.5
ovoidal	19	5.1
parallelepiped	4	1.1
pebble	18	4.8
pyramid	1	0.3
sphendonoid	191	50.8
sphere	45	12.0
trapezoidal	1	0.3
triangular	1	0.3
truncated cone	3	0.8
unstratified	3	0.8
Total	376	100.0

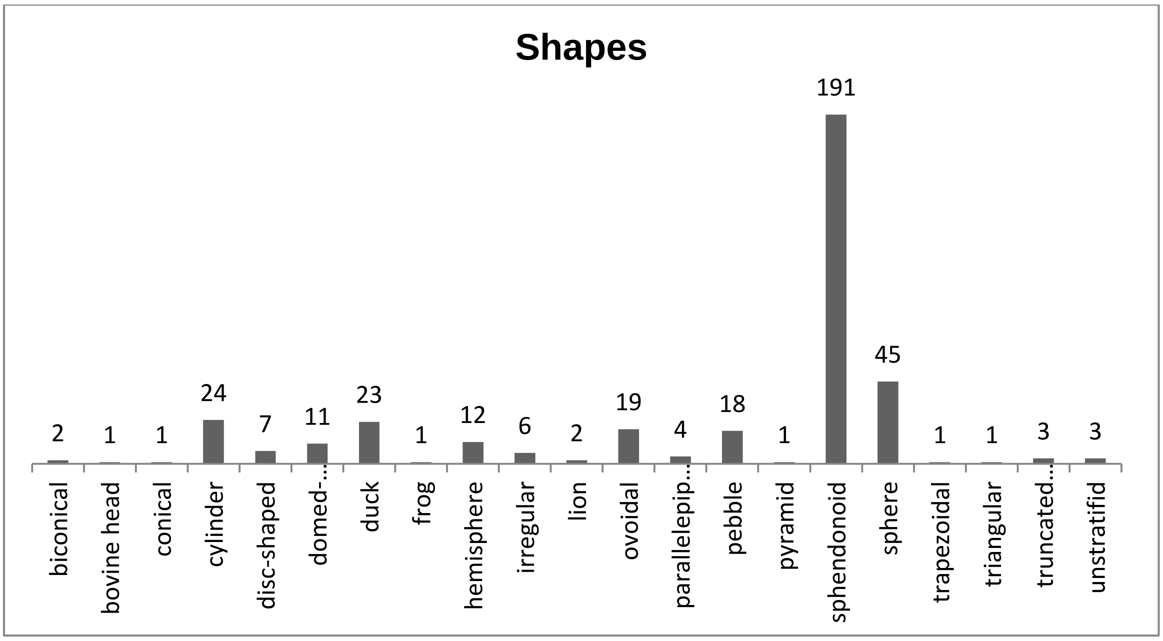

Figure 61. Frequency and percentage of balance weights according to the shape.

Context		N. of weights	Area excavated (sq. m)
Domestic (1)	Count (Percentage)	20 (11.1)	1,800 (8.7)
Palatial (2)	Count (Percentage)	106 (58.9)	10,900 (52.4)
Religious (3)	Count (Percentage)	11 (6.1)	4,800 (23.1)
Military (4)	Count (Percentage)	43 (23.9)	3,300 (15.9)
Total		180	20800

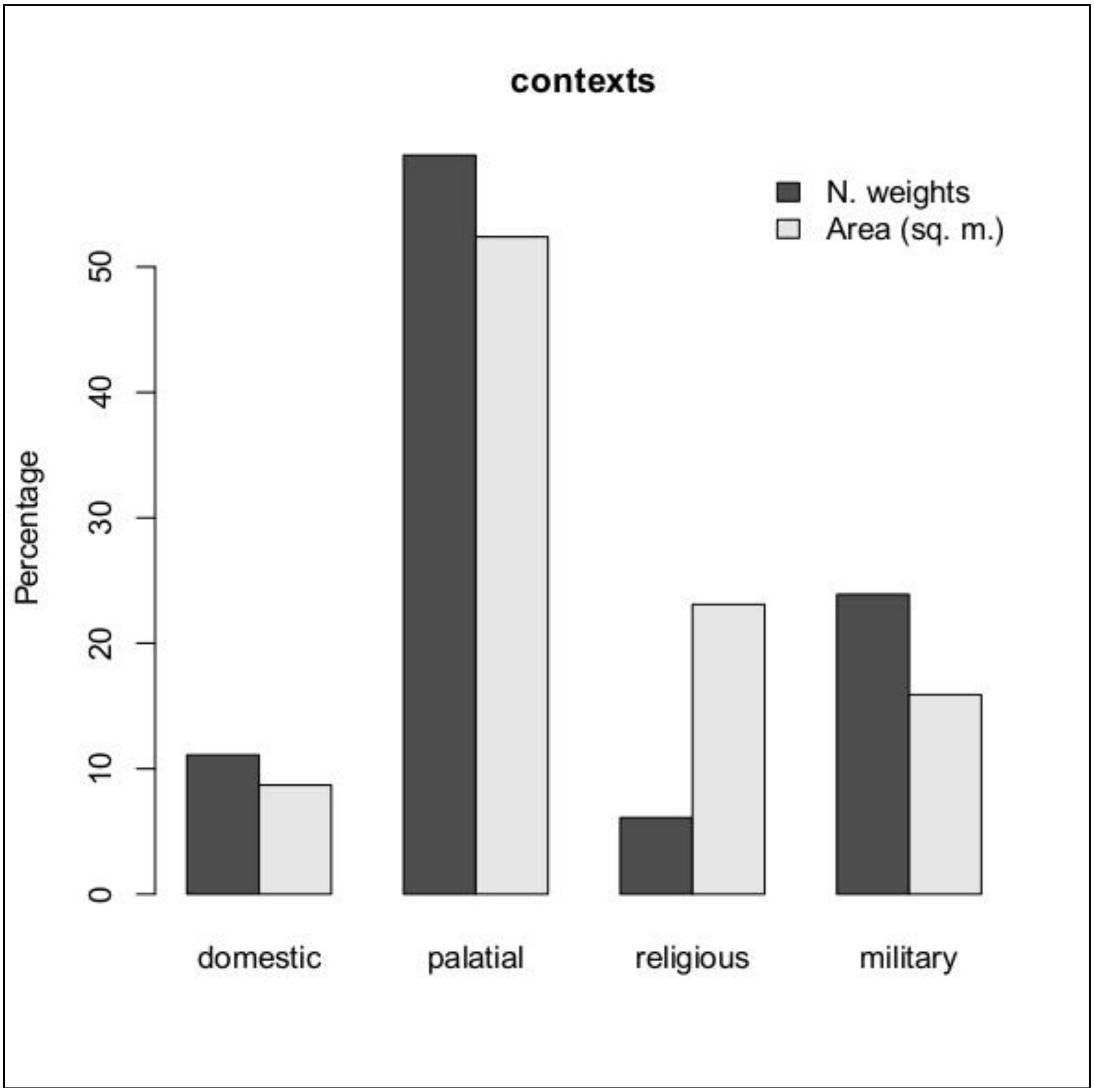

Figure 62. Frequency and percentage of balance weights according to the context at Tell Mardikh (Ebla).

Context		Weight system					
		Anatolian	Levantine	Mesopotamian	Syrian	Aegean	Total
Domestic	Count (Expected count)	2 (3.5)	5 (3.7)	6 (5.9)	4 (5)	5 (3.9)	22
Palatial	Count (Expected count)	17 (17.9)	18 (18.5)	27 (29.8)	34 (25.1)	15 (19.7)	111
Religious	Count (Expected count)	1 (1.1)	0 (1.2)	1 (1.9)	3 (1.6)	2 (1.2)	7
Military	Count (Expected count)	10 (7.4)	8 (7.7)	16 (12.4)	1 (10.4)	11 (8.2)	46
Total 43		30	31	50	42		**186**

X-squared = 21.0746, df = 12, p-value = **0.0493**

Figure 63. Cross-tabulation of “Style” and “Context” variables. In yellow the most informative evidence.

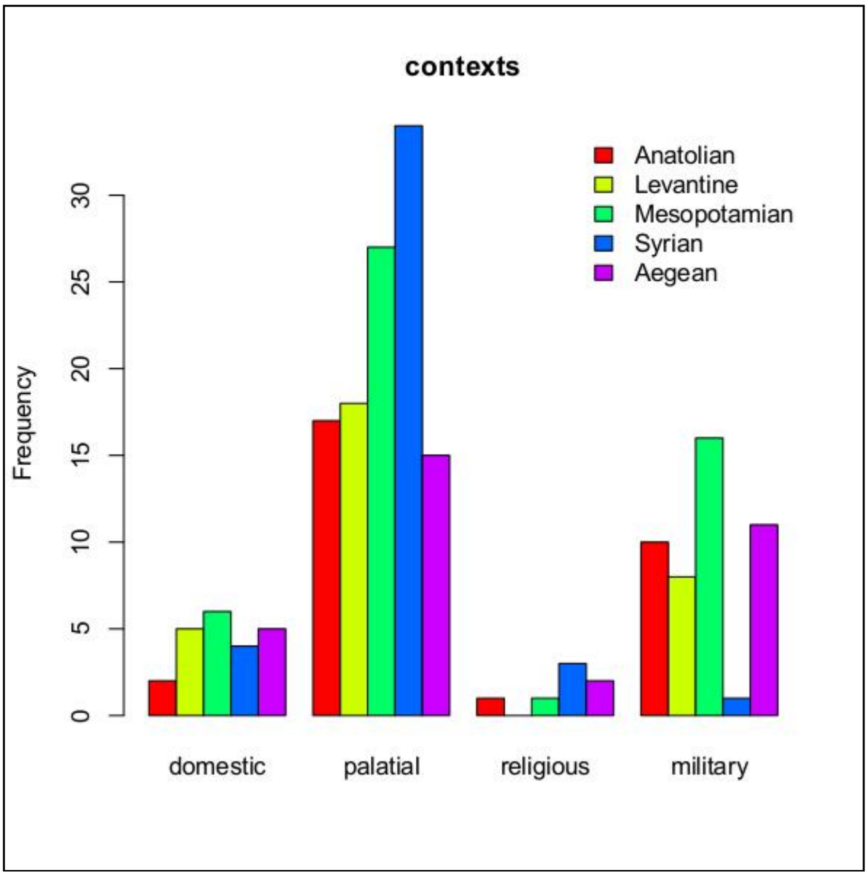

Figure 64. Frequency of different weight systems according to the context at Tell Mardikh (Ebla).

Weight System		Zones			
		Anatolia	Syria	North Mesopotamia (Aššur)	Total
Anatolian	Count (expected count)	11 (14.9)	31 (25.6)	5 (6.5)	47
Levantine	Count (expected count)	13 (19.4)	37 (33.2)	11 (8.4)	61
Mesopotamian	Count (expected count)	51 (42.3)	58 (72.4)	24 (18.3)	133
Syrian	Count (expected count)	34 (35)	63 (59.9)	13 (15.1)	110
Aegean	Count expected count)	23 (20.4)	37 (34.9)	4 (8.8)	64
Total		132	226	57	415

X-squared = 15.9055, df = 8, p-value = **0.04375**

Figure 65. Cross-tabulation of “Weight System” and “Zone” variables. In yellow the most informative evidence.

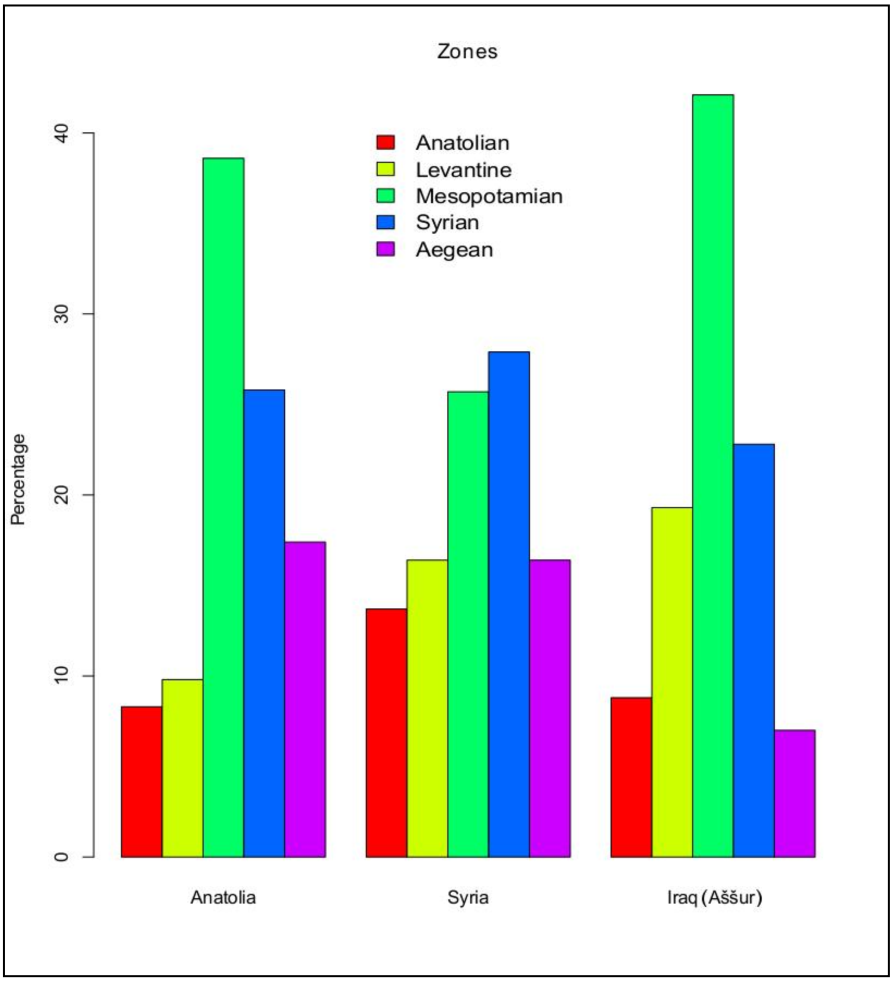

Figure 66. Percentages of different weight systems according to the distribution zones.

Weight system	minimum	1st quartile	median	mean	3rd quartile	maximum
Anatolian	10.5	11.4	11.70	11.63	11.87	12.20
Levantine	8.90	9.10	9.36	9.34	9.50	10.2
Mesopotamian	8	8.20	8.35	8.39	8.52	8.97
Syrian	7.25	7.60	7.80	7.87	8	8.25
Aegean	6.2	6.47	6.60	6.59	6.75	6.91

Figure 67. Summary of central tendency and dispersion of mass of standard units (in grams).

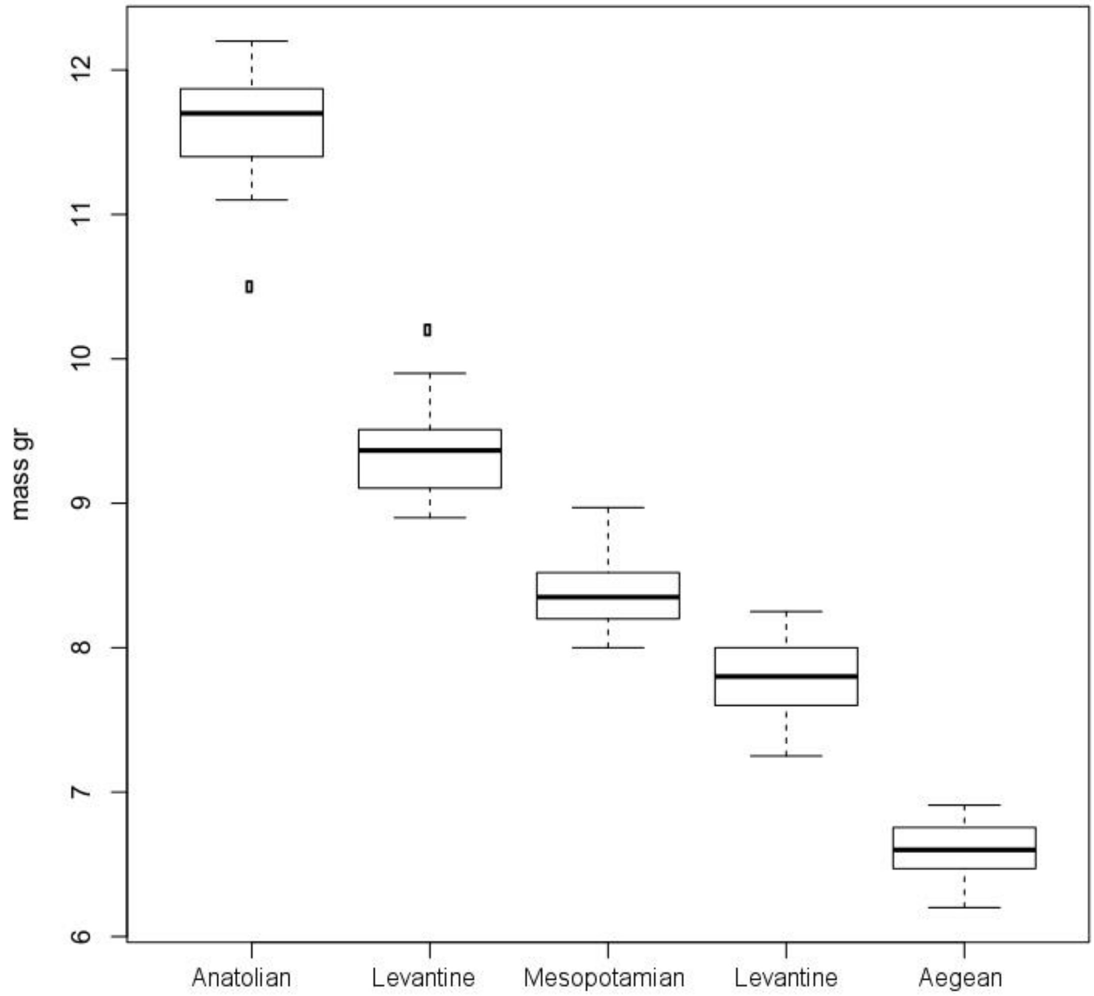

Figure 68. Box and whisker plot of mass (grams) of standard unit (one shekel) according to the weight system.

Weight Systems							
Ratio	Anatolian	Levantine	Mesopotamian	Syrian	Aegean	Overall	Cumulative %
1/30		1				1	0.2
1/24				1		1	0.5
1/12					1	1	0.7
1/10			1	1		2	1.2
1/8		1				1	1.5
1/6		1		2	2	5	2.7
1/5		2	2			4	3.7
1/4	2	1	5	3	2	13	6.8
1/3	2	4	3	1	2	12	9.8
1/2	8	5	5	6	3	27	16.3
2/3	8		7	6		21	21.4
1		10	31	23	9	73	39.1
2	3	6	9	15	5	38	48.4
3			10	6	3	19	53.0
4	7	3	3	3	5	21	58.1
5	4	7	8	4		23	63.7
6			4	7	3	14	67.1
7			3	2	5	10	69.5
8	4	1	7	3	1	16	73.4
9					2	2	74
10	2	5	14	8	10	39	83.4
12		1	2	3	1	7	85.1
14				3	3	6	86.5
16	1					1	86.7
18					1	1	86.9
20		3	8	2		13	90
24				1		1	90.2
28					1	1	90.4
30			3	2		5	91.6
33					1	1	91.8
40	1	2	1			4	92.8
50		1	1	2		4	93.8
60		1	2	1		4	94.8
70					1	1	95
80	1					1	95.2
100		1	1			2	95.7
120			1	1		2	96.2
160	1					1	96.4
180					1	1	96.6
200		2				2	97.1
240	1		1	1		3	97.8
300		1				1	98
320	1					1	98.2
360	1			1		2	98.7
400		1				1	98.9
450		1				1	99.1
480				1		1	99.3
500						0	98.7
540				1		1	99.6
600			1			1	99.8
630					1	1	100
Tota	47	61	133	110	64	415	

Figure 69. Quantitative distribution of balance weights by system and ratio.

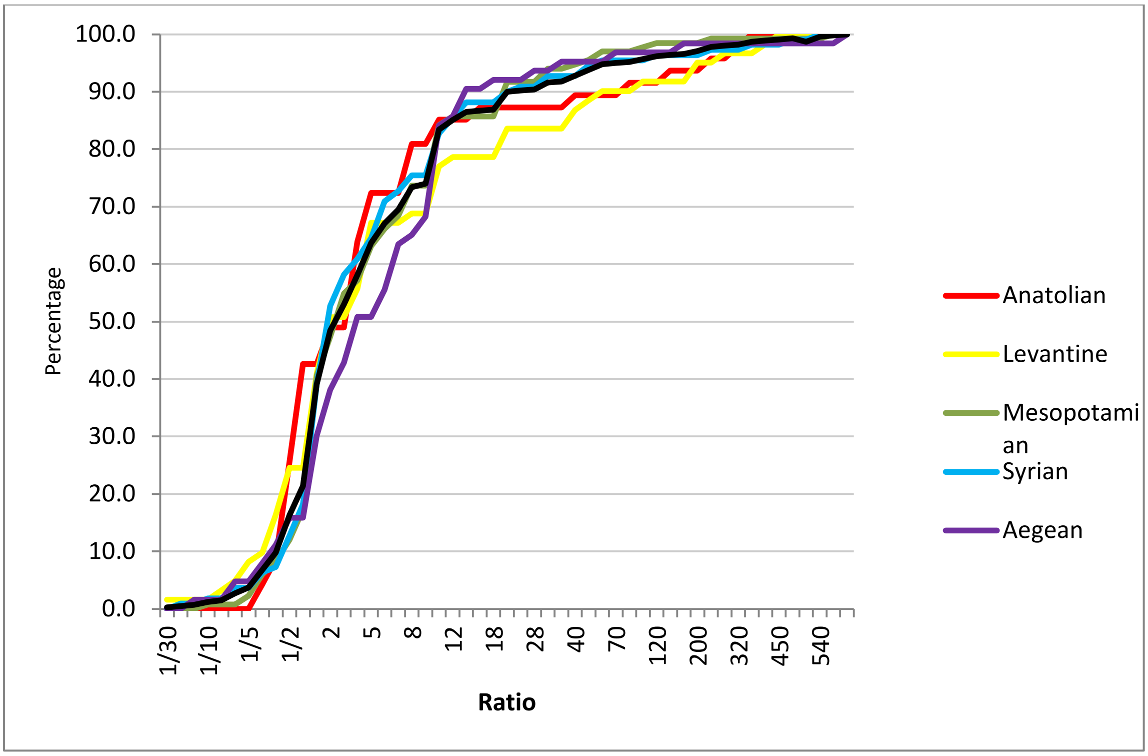

Figure 70. Cumulative percentage of balance weights by ratio.

quantum	Φ(τ)	multiple	unit (shekel)
2.8	3.21	1/4	11.2
5.8	3.0247	1/2	11.6
11.6	3.0245	1	11.6

Figure 71. Kendall results for 37 Anatolian weights**.**

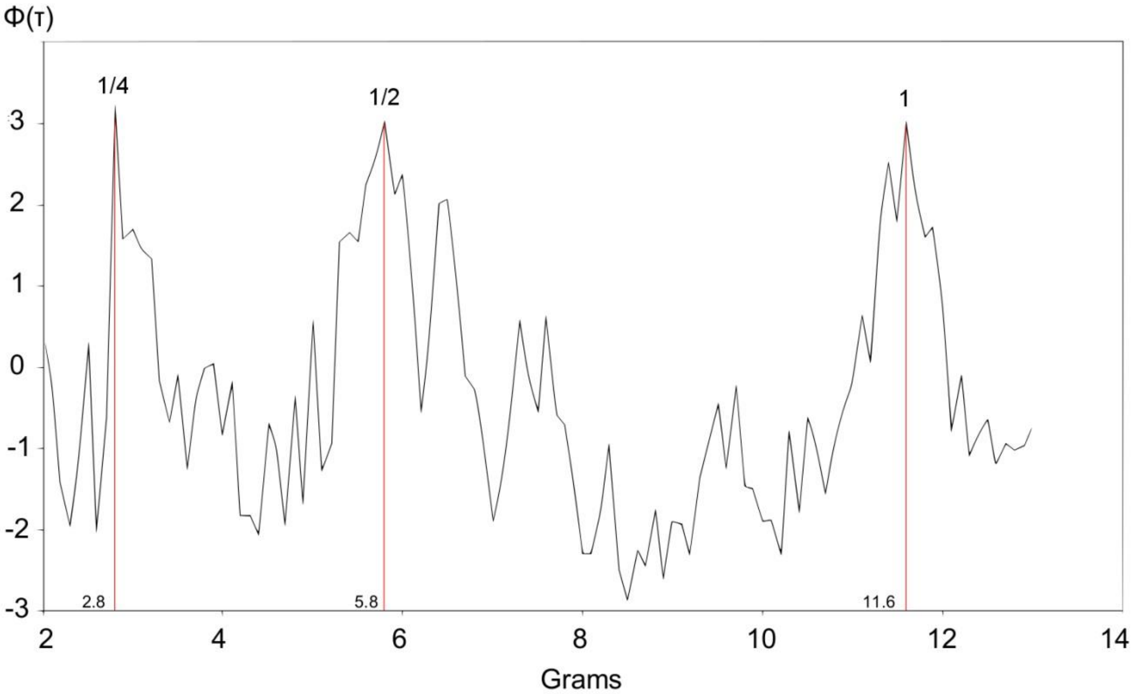

Figure 72. Kendall statistics graph of 37 Anatolian weights.

quantum	Φ(τ)	multiple	unit (shekel)
4.8	3.78	1/2	9.6
9.4	4.28	1	9.4

Figure 73. Kendall results for 53 Levantine weights.

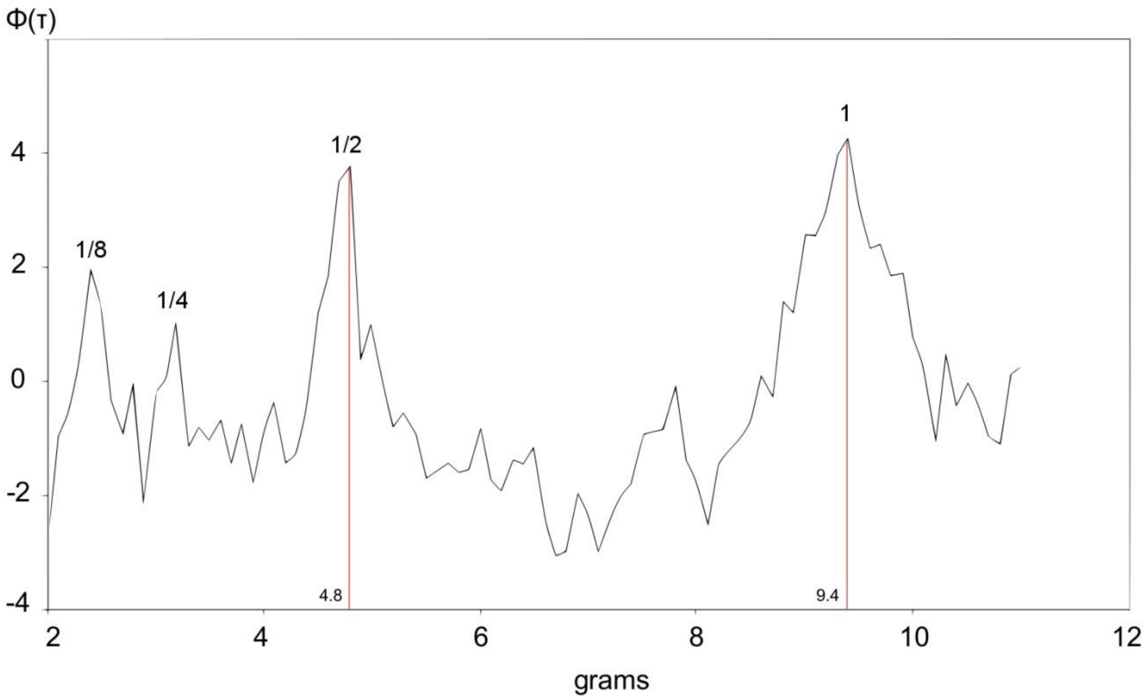

Figure 74. Kendall statistics graph of 53 Levantine weights.

quantum	Φ(τ)	multiple	unit (shekel)
2.1	4.27	1/4	8.4
2.7	5.27	1/3	8.1
4.1	4.81	1/2	8.2
8.2	6.72	1	8.2
8.8	3.68	1	8.8

Figure 75. Kendall results for 125 Mesopotamian weights.

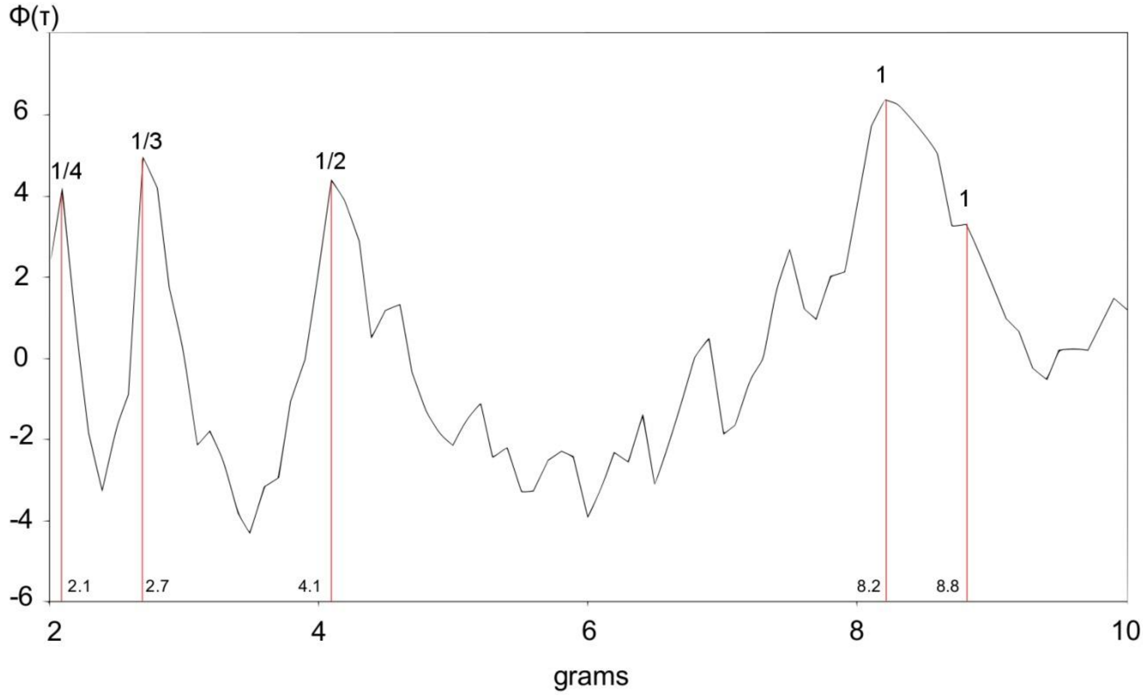

Figure 76. Kendall statistics graph of 125 Mesopotamian weights.

quantum	Φ(τ)	multiple	unit (shekel)
2.5	2.49	1/3	7.5
2.7	2.60	1/3	8.1
3.8	3.53	1/2	7.6
7.3	3.71	1	7.3
7.8	5.85	1	7.8

Figure 77. Kendall results for 93 Syrian weights.

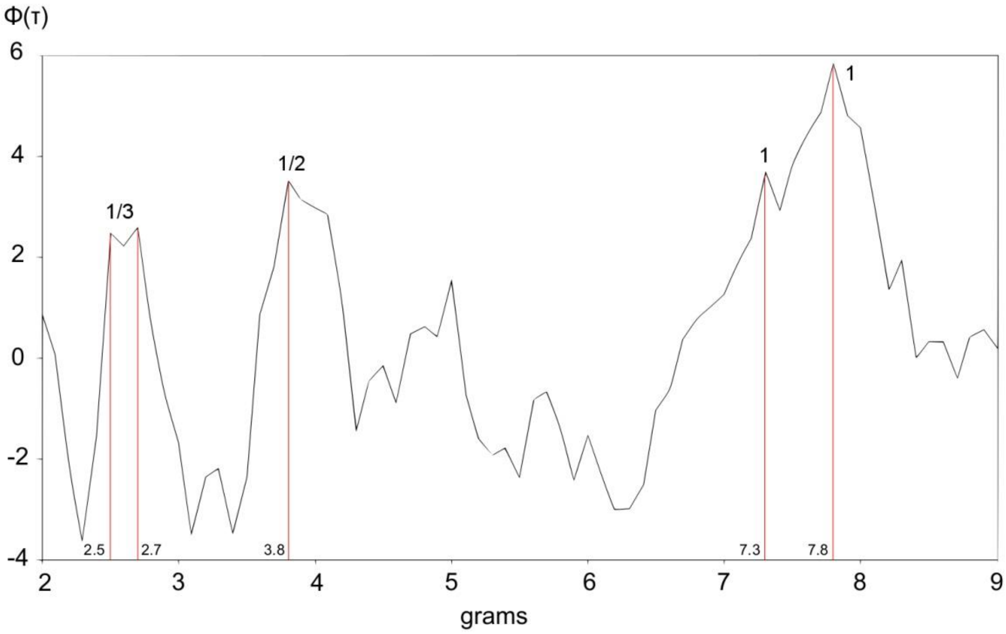

Figure 78. Kendall statistics graph of 93 Syrian weights.

quantum	Φ(τ)	multiple	unit (shekel)
2.2	1.72	1/3	6.6
3.3	3.41	1/2	6.6
6.4	2.93	1	6.4
6.6	3.88	1	6.6
6.8	4.58	1	6.8

Figure 79. Kendall results for 55 Aegean weights.

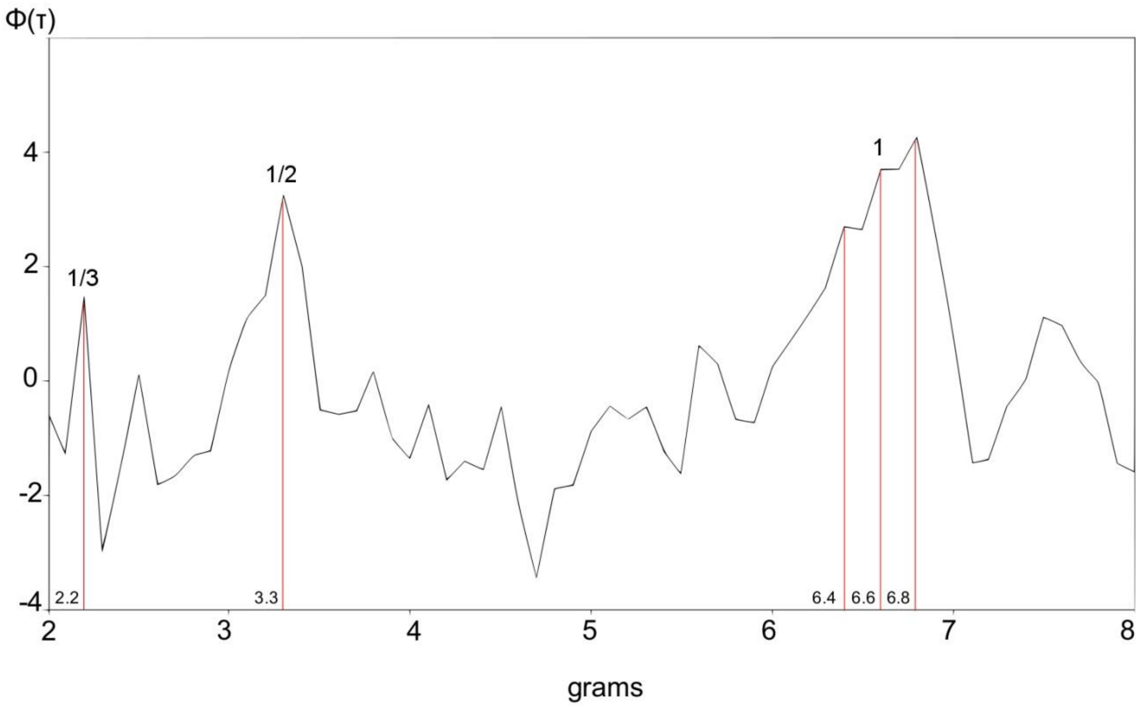

Figure 80. Kendall statistics graph of 55 Aegean weights.

quantum	Φ(τ)	multiple	unit (shekel)
2.7	2.77	1/3	8.1
4.1	3.37	1/2	8.2
7.5	2.90	1	7.5
7.8	3.05	1	7.8
8.3	3.36	1	8.3
8.6	2.39	1	8.6

Figure 81. Kendall results for 277 weights.

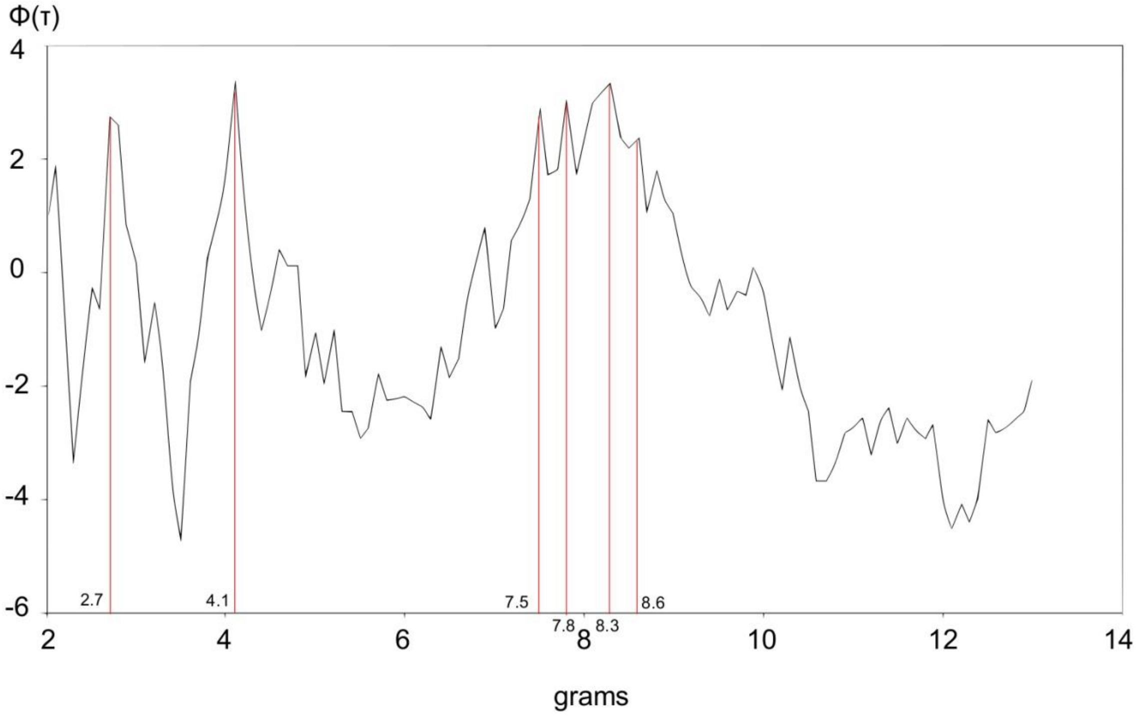

Figure 82. Kendall statistics graph of 277 weights.

Figure 83. Distribution of cylinder and stamp seals in Upper Mesopotamia and central/south-eastern Anatolia during the Middle Bronze Age (ca. 2000 – 1600 BC).

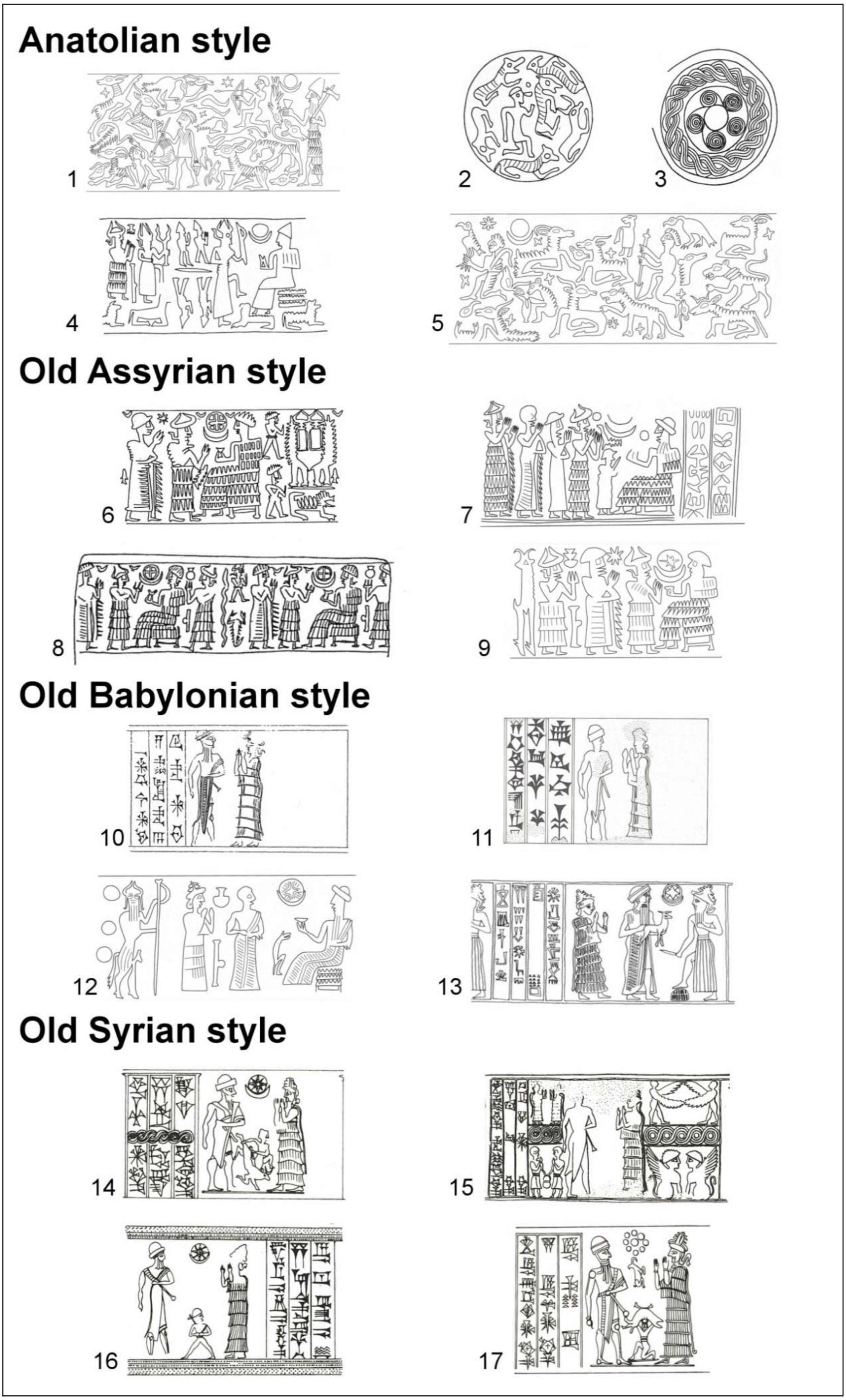

Figure 84. Glyptic regional styles in the Ancient Near East during the Middle Bronze Age.

References to the illustration on Fig. 84

1. Özgüç, N., 2006, Pl. 4:CS 269. House of Peruwa, Kültepe's lower town level II.

2. Özgüç, N., and Tunca, O., 2001, Pl. 20:St 58. Kültepe's lower town level II.

3. Özgüç, N., and Tunca, O., 2001, Pl. 20:St 50. Kültepe's lower town level II.

4. Özgüç, N., and Tunca, O., 2001, Pl. 21:CS 115. Kültepe's lower town level II.

5. Özgüç, N., 2006, Pl. 4:CS 255. House of Peruwa, Kültepe's lower town level II.

6. Teissier, B., 1994, 216:109. Kültepe's lower town level II.

7. Özgüç, N., 2006, Pl. 51:CS 577. House of Uṣur-ša-Ištar, Kültepe's lower town level II.

8. Teissier, B., 1994, 216:101. Kültepe's lower town level II.

9. Özgüç, N., 2006, Pl. 36:CS 472. House of Uṣur-ša-Ištar, Kültepe's lower town level II.

10. Parayre, D., 1990, 559:5. Tell Leilan.

11. Hawkins, J. D., 1976, Pl.109:14. Tell al Rimah.

12. Özgüç, N., 2006, Pl. 47:CS 548. House of Uṣur-ša-Ištar, Kültepe's lower town level II.

13. Marchetti, N., 2011, 109-110. Tilmen Höyük.

14. Otto, A., 2000, Pl.38:461. Tell al-Rimah.

15. Otto, A., 2000, Pl.38:460. Tell Hariri.

16. Otto, A., 2000, Pl.39:470. Tell Leilan.

17. Otto, A., 2000, Pl.38:452. Tell Bi'a.

Site	Area	No. items	References
Middle Bronze Age I (ca. 2000-1800 BC)			
Central/South-eastern Anatolia			
Acemhöyük	Central Anatolia	3	Özgüç 1971
Kültepe (Kaneš)	Central Anatolia	1617	Keel-Leu and Teissier 2004; Özgüç 1965; 1968, 1986b, 2006; Özgüç and Tunca 2001; Teissier 1994.
Tell Atchana (Alalakh)	Amuq valley	7	Collon 1975 and 1982
Tilmen Höyük	Islahiye valley	4	Marchetti 2011
Syria			
Ras Shamra (Ugarit)	Latakia	14	Amiet 1992; Schaeffer-Forrer 1983
Tell Bi'a (Tuttul)	Balikh valley	12	Otto 2004
Tell Hariri (Mari)	Middle Euphrates	14	Parrot 1959a
Tell Mardikh (Ebla)	Idlib	1	Matthiae 1994
Tell Mohammed Diyab	Khabur Triangle	2	Bachelot 1992; Castel 1990
	Total	**1674**	
Middle Bronze Age II (ca. 1800-1600 BC)			
Central/South-eastern Anatolia			
Acemhöyük	Central Anatolia	53	Özgüç 1971 and 1980; Tunca 1993
Alişar Höyük (Amkuwa)	Central Anatolia	1	Von der Osten 1937
Bögazköy (Hattuša)	Central Anatolia	155	Boehmer and Güterbock 1987; Neve 1982.
Gözlü Kule (Tarsus)	Cilicia	1	Goldman 1956
Kaman-Kalehöyük	Central Anatolia	1	Omura 2006
Karahöyük	Konya plain	6	Alp 1968
Kenan Tepe	Upper Tigris valley (Diyarbakir)	1	Parker and Dodd 2003
Kültepe (Kaneš)	Central Anatolia	162	Özgüç 1965 and 1968; Özgüç and Tunca 2001
Norşuntepe	Upper Tigris valley	1	Schmidt 2002
Tell Atchana (Alalakh)	Amuq valley	48	Collon 1975 and 1982; Woolley 1955
Tilmen Höyük	Islahiye valley	7	Marchetti 2011
Syria			
Minat al Bayda	Latakia	2	Amiet 1992
Ras Shamra (Ugarit)	Latakia	32	Amiet 1992; Hammade 1994; Schaeffer-Forrer 1983
Tell Ahmar (Til Barsip)	Balikh valley	1	Otto 1998
Tell Ashara (Terqa)	Middle Euphrates	6	Buccellati and Kelly-Buccellati 1983
Tell Bi'a (Tuttul)	Balikh valley	91	Otto 2004
Tell Hammam et-Turkman	Balikh valley	1	Meijer 1998
Tell Hariri (Mari)	Middle Euphrates	84	Beyer 1984; Hammade 1994; Parrot 1959a and 1959b
Tell Mardikh (Ebla)	Idlib	30	Hammade 1994; Matthiae 1969 and

			1994; Matthiae et al. 1995
Tell Meskene (Emar)	Balikh	45	Beyer 2001
Tell Mishrife (Qatna)	Orontes valley	1	Morandi Bonacossi and Eidem 2006
Umm el-Marra	Jabbul plain	5	Curvers et al. 1997; Schwartz 2012
Northern Mesopotamia (Northern Iraq and Khabur Triangle)			
Chagar Bazar	Khabur Triangle	27	Beyer 2008; Mallowan 1937; McMahon et al. 2001; Schaeffer 1974
Qal'at Sherqat (Aššur)	'Afar plain	3	Hockmann 2010
Nineveh	'Afar plain	2	Reade 2005
Tell al-Rimah	'Afar plain	33	Dalley et al. 1976; Hawkins 1976; Parker 1975
Tell Fakhariya	Khabur Triangle	1	McEwan et al. 1958
Tell Leilan (Shubat-Enlil)	Khabur Triangle	41	Parayre 1987-88, 1990 and 1993
	Total	**841**	

Figure 85. List of sites yielding seals/impressions in central/south-eastern Anatolia and Upper Mesopotamia during the Middle Bronze Age.

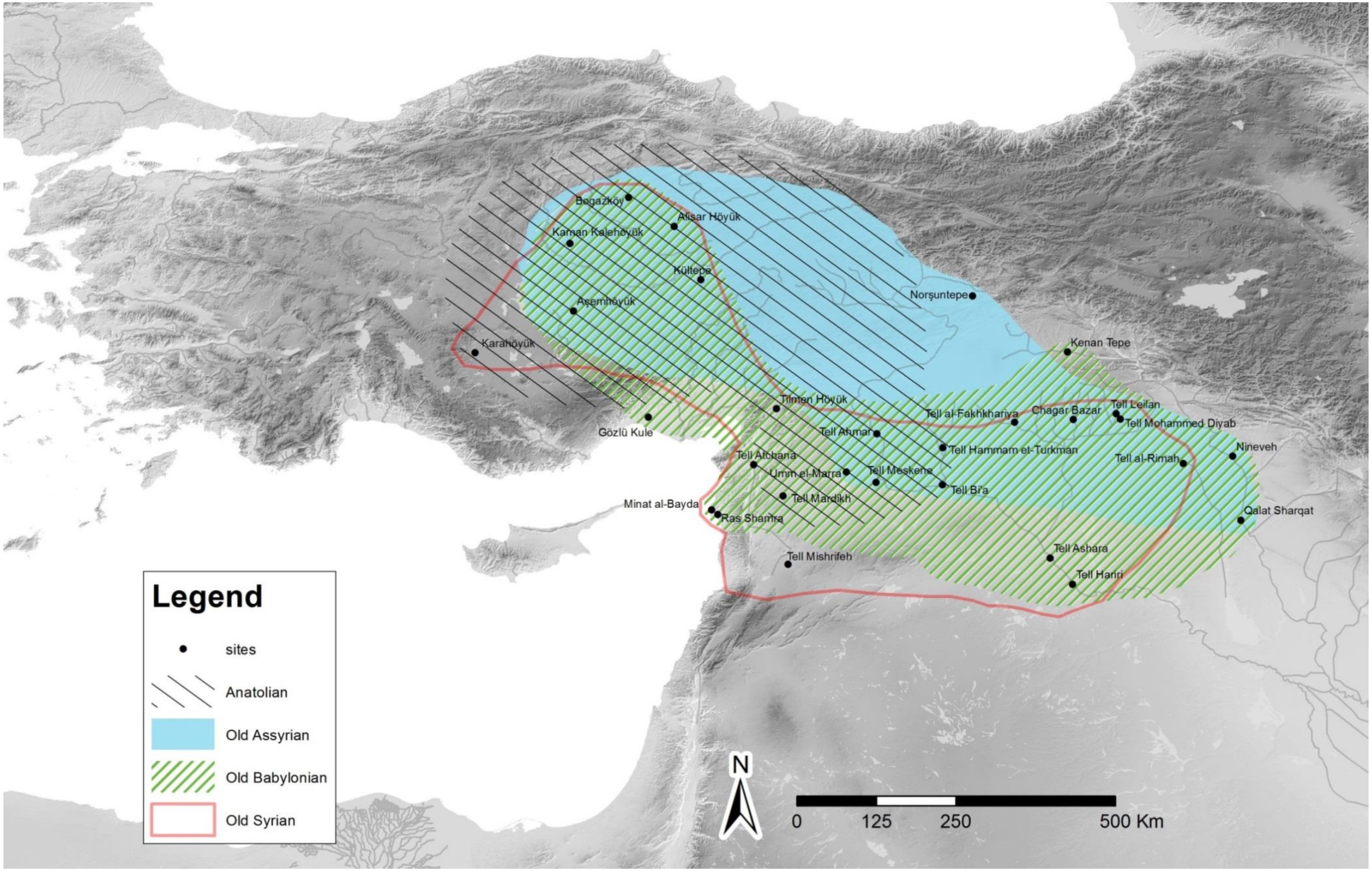

Figure 86. Distribution of glyptic regional styles in in Upper Mesopotamia and central/south-eastern Anatolia during the Middle Bronze Age (ca. 2000 – 1600 BC).

Materials	Frequency	Percentage
alabaster	2	0.6
basalt	1	0.3
bone	1	0.3
brown stone	7	2.3
chalcedony	2	0.6
clay	29	9.4
gypsum	4	1.3
green stone	3	1
grey stone	9	2.9
hematite	134	43.5
jasper	5	1.6
ivory	2	0.6
lapis lazuli	2	0.6
limestone	2	0.6
marble	2	0.6
porphyry	3	1
sandstone	1	0.3
serpentine	18	5.8
shell	1	0.3
steatite	31	10.1
stone	45	14.6
white stone	4	1.3
Total	308	100.0

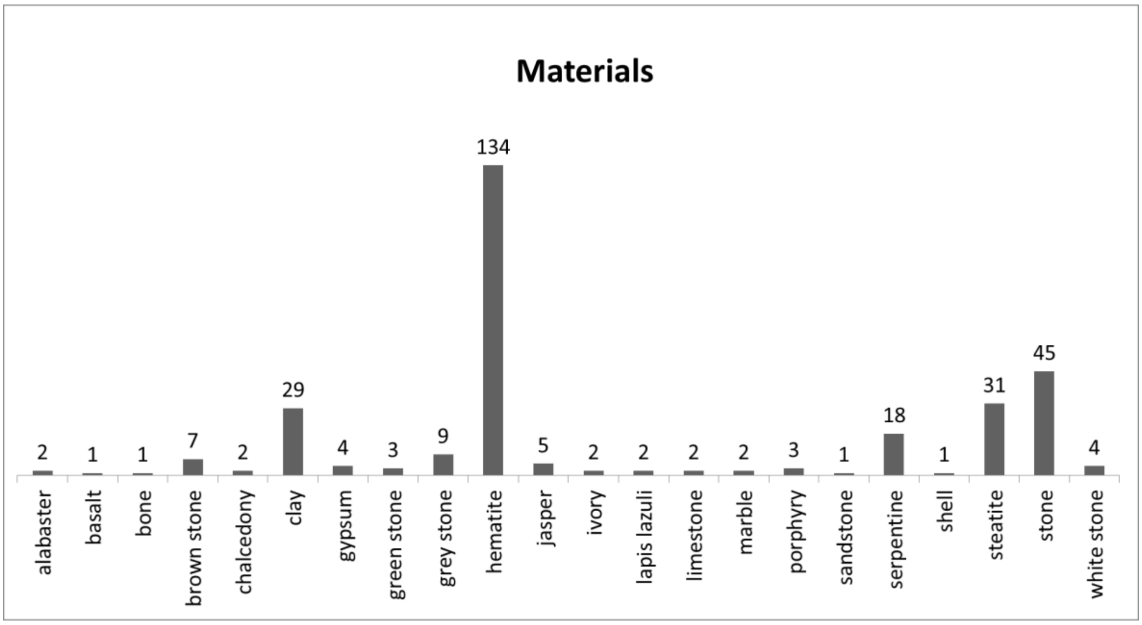

Figure 87. Frequency and percentage of seals according to the material.

Materials		Zones			
		Anatolia	Syria	North Mesopotamia (Iraq and KT)	Total
alabaster	Count (expected count)	2 (1.1)	0 (0.9)	0 (0)	2
basalt	Count (expected count)	1 (0.5)	0 (0.4)	0 (0.1)	1
bone	Count (expected count)	0 (0.5)	1 (0.4)	0 (0.1)	1
brown stone	Count (expected count)	7 (3.8)	0 (3.1)	0 (0.1)	7
chalcedony	Count (expected count)	1 (1.1)	0 (0.9)	1 (0)	2
clay	Count (expected count)	19 (15.6)	10 (13)	0 (0.4)	29
gypsum	Count (expected count)	0 (2.2)	4 (1.7)	0 (0.1)	4
green stone	Count (expected count)	1 (1.6)	2 (1.3)	0 (0.1)	3
grey stone	Count (expected count)	9 (4.9)	0 (4)	0 (0.1)	9
hematite	Count (expected count)	47 (72.2)	85 (60)	2 (1.8)	134
jasper	Count (expected count)	5 (2.7)	0 (2.2)	0 (0.1)	5
ivory	Count (expected count)	2 (1.1)	0 (0.9)	0 (0)	2
lapis lazuli	Count (expected count)	1 (1.1)	1 (0.9)	0 (0)	2
limestone	Count (expected count	1 (1.1)	1 (0.9)	0 (0)	2
marble	Count (expected count)	1 (1.1)	1 (0.9)	0 (0)	2
porphyry	Count (expected count)	3 (1.6)	0 (1.3)	0 (0.1)	3
sandstone	Count (expected count)	1 (0.5)	0 (0.9)	0 (0.1)	1
serpentine	Count (expected count)	15 (9.7)	3 (8.1)	0 (0.2)	18
shell	Count (expected count)	1 (0.5)	0 (0.4)	0 (0.1)	1
steatite	Count (expected count)	10 (16.7)	21 (13.9)	0 (0.4)	31
stone	Count (expected count)	36 (24.3)	9 (20.2)	0 (0.5)	45
white stone	Count (expected count)	3 (2.2)	0 (1.7)	1 (0.1)	4
Total		**166**	**138**	**4**	**308**

[X-squared = 136.7698, df = 42, **p-value<0.001**]

Figure 88. Cross-tabulation of “Materials” and “Zone” variables. In yellow the most informative evidence.

Object impressed	Frequency		Percentage	
	MBI	MBII	MBI	MBII
Bulla	447	286	27.4	51.7
Tablet	2	208	0.1	37.5
Envelope	1184	60	72.5	10.8
Total	1632	554	100	100

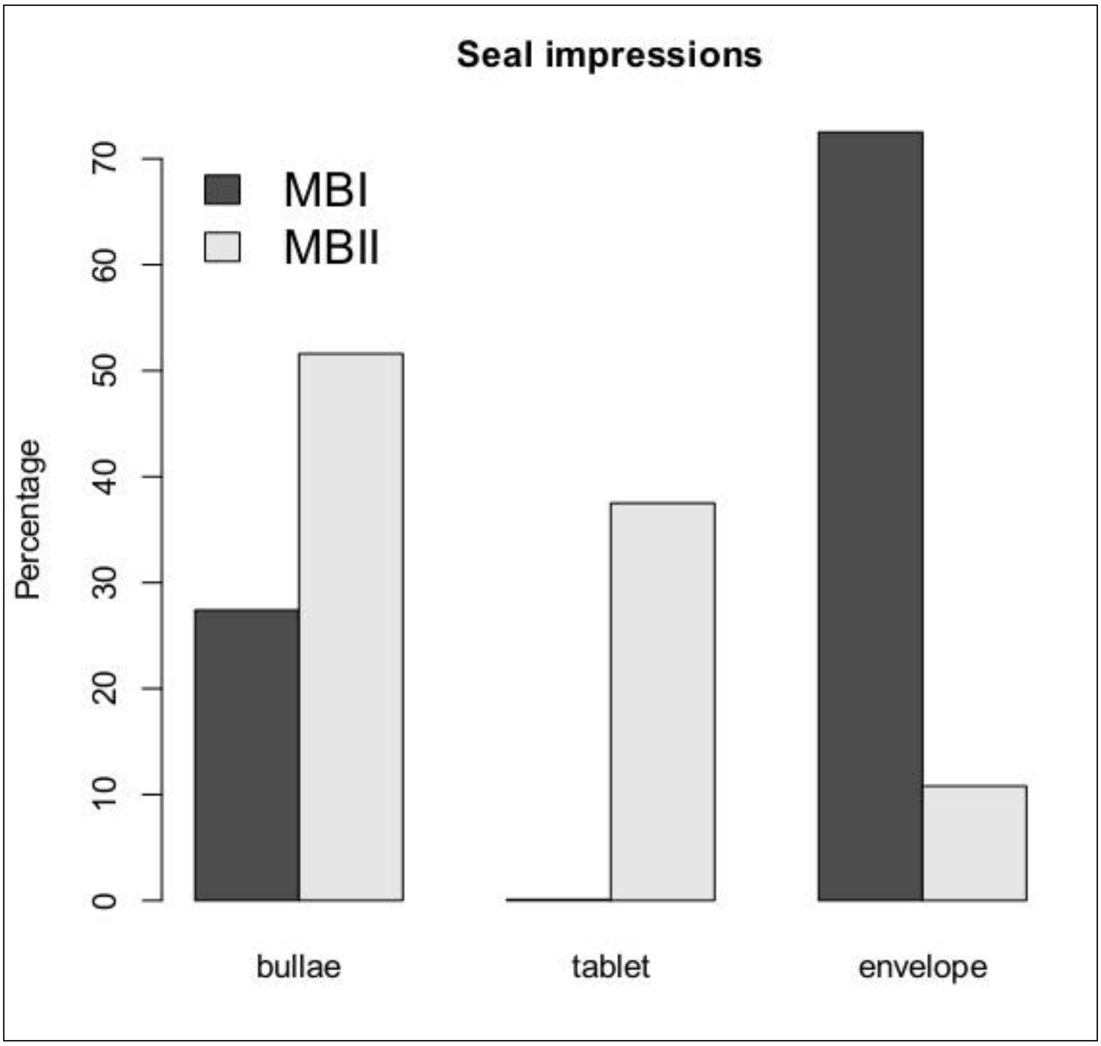

Figure 89. Frequency and percentage of kinds of objects bearing seal impressions in the Middle Bronze Age I and II.

Context	Frequency	Percentage
Domestic	1753	80.3
Palatial	359	16.5
Religious	47	2.2
Funerary	19	0.8
Military	4	0.2
Total	2182	100

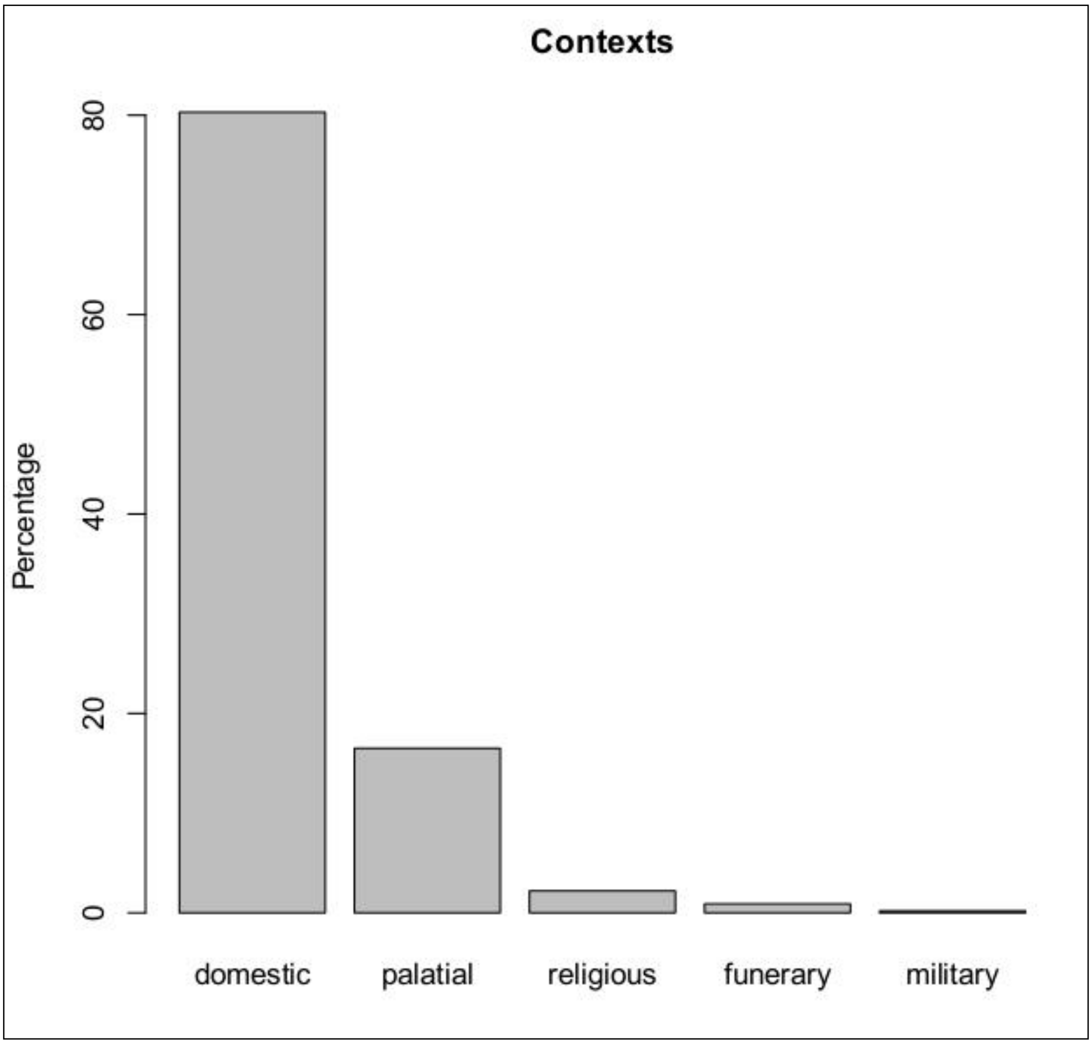

Figure 90. Frequency and percentage of seals/impressions according to the context.

Context		Anatolia				
		Anatolian	Old Assyrian	Old Babylonian	Old Syrian	Total
Domestic	Count (Expected count)	636 (538.8)	711 (592.9)	218 (341.1)	174 (266.2)	1739
Palatial	Count (Expected count)	37 (31.6)	7 (34.8)	24 (20)	34 (15.6)	102
Religious	Count (Expected count)	0 (0.9)	0 (1)	0 (0.6)	3 (0.5)	3
Military	Count (Expected count)	0 (1.2)	0 (1.4)	2 (0.8)	2 (0.6)	4
	Total	673	718	244	213	1848

Context		Syria				
		Anatolian	Old Assyrian	Old Babylonian	Old Syrian	Total
Domestic	Count (Expected count)	0 (3.7)	0 (4.1)	0 (2.4)	12 (1.8)	12
Palatial	Count (Expected count)	2 (59.8)	17 (65.8)	108 (37.9)	66 (29.5)	193
Religious	Count (Expected count)	0 (6.2)	0 (6.8)	18 (3.9)	2 (3.1)	20
Military	Count (Expected count)	0 (0)	0 (0)	0 (0)	0 (0)	0
	Total	2	17	126	80	225

Context		Northern Mesopotamia (Iraq and Khabur Triangle)				
		Anatolian	Old Assyrian	Old Babylonian	Old Syrian	Total
Domestic	Count (Expected count)	0 (0.6)	0 (0.7)	0 (0.4)	2 (0.3)	2
Palatial	Count (Expected count)	0 (19.8)	3 (21.8)	41 (12.6)	20 (9.8)	64
Religious	Count (Expected count)	0 (7.4)	0 (8.2)	16 (4.7)	8 (3.7)	24
Military	Count (Expected count)	0 (0)	0 (0)	0 (0)	0 (0)	0
	Total	0	3	57	30	90

[X-squared = 749.4554, df = 42, **p-value < 0.001**]

Figure 91. Cross-tabulation of "Style" and "Context" variables for each distribution zone. In yellow the most informative evidence.

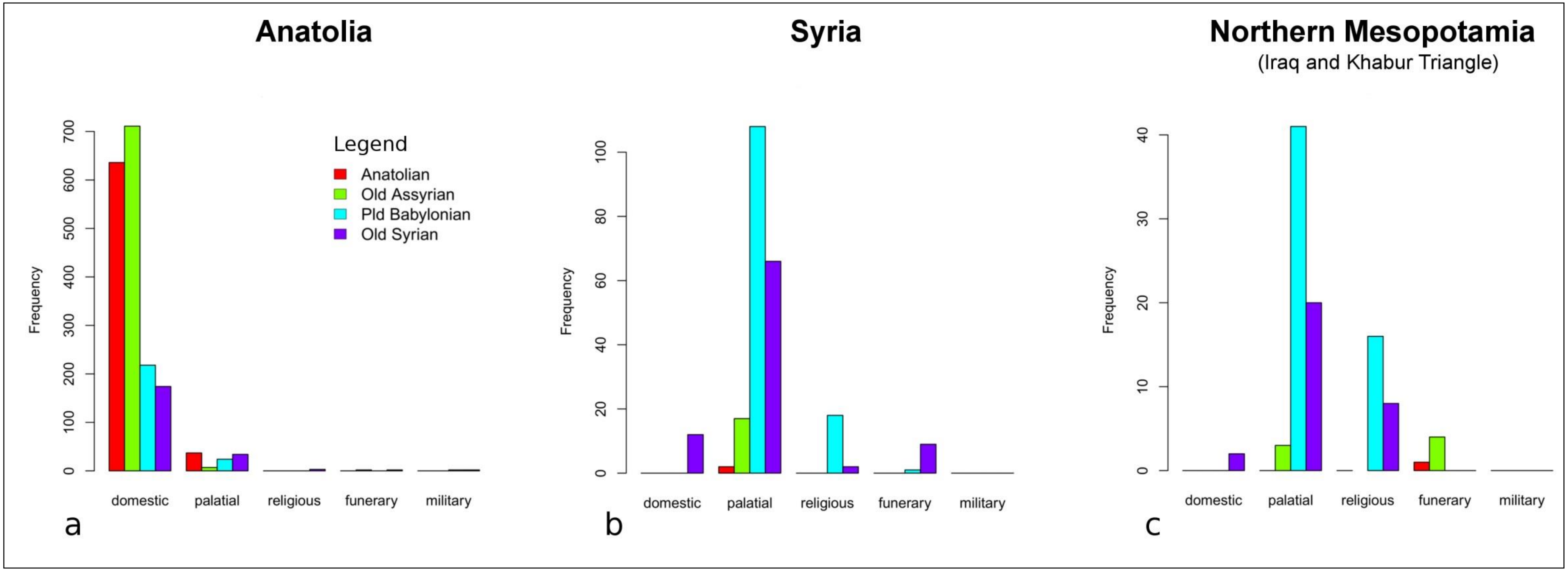

Figure 92. Frequency of different regional styles according to the context and the distribution area.

Style		House		
		House of Peruwa	House of Uşur-ša-Ištar	Total
Anatolian	Count (Expected)	107 (41.1)	71 (136.9)	178
Old Assyrian	Count (Expected)	30 (66.3)	257 (220.7)	287
Old Babylonian	Count (Expected)	6 (16.9)	67 (56.1)	73
Old Syrian	Count (Expected)	9 (24.7)	98 (82.3)	107
Ur III	Count (Expected)	0 (3)	13 (10)	13
Total		152	506	658

[X-squared = 189.1111, df = 4, **p-value < 0.001**]

Figure 93. Cross-tabulation of "Style" and "House" variables. In yellow the most informative evidence.

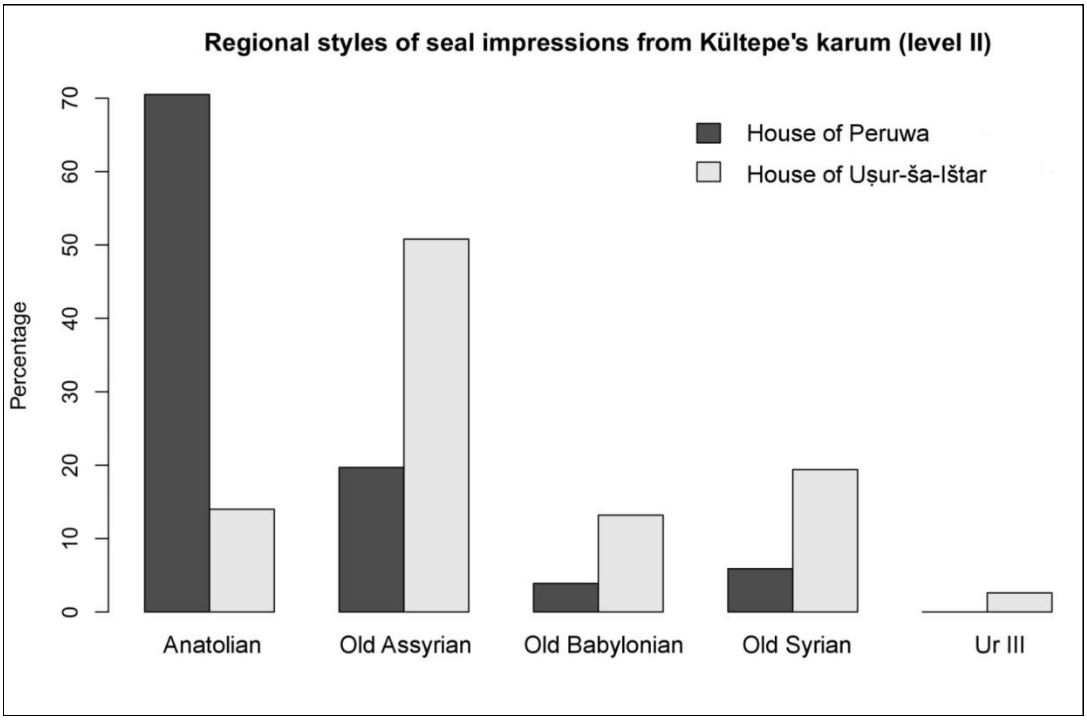

Figure 94. Percentages of different regional styles according to the house.

Style		Zones			
		Anatolia	Syria	North Mesopotamia (Iraq and Khabur Triangle)	Total
Anatolian	Count (expected count)	673 (573.8)	2 (72.8)	1 (29.4)	676
Old Assyrian	Count (expected count)	720 (631.5)	17 (80.1)	7 (32.4)	724
Old Babylonian	Count (expected count)	244 (363.3)	127 (46.1)	57 (18.6)	428
Old Syrian	Count (expected count)	215 (283.5)	89 (36)	30 (14.5)	334
	Total	1852	235	95	2182

[X-squared = 566.8396, df = 6, **p-value < 0.001**]

Figure 95. Cross-tabulation of "Style" and "Zone" variables. In yellow the most informative evidence.

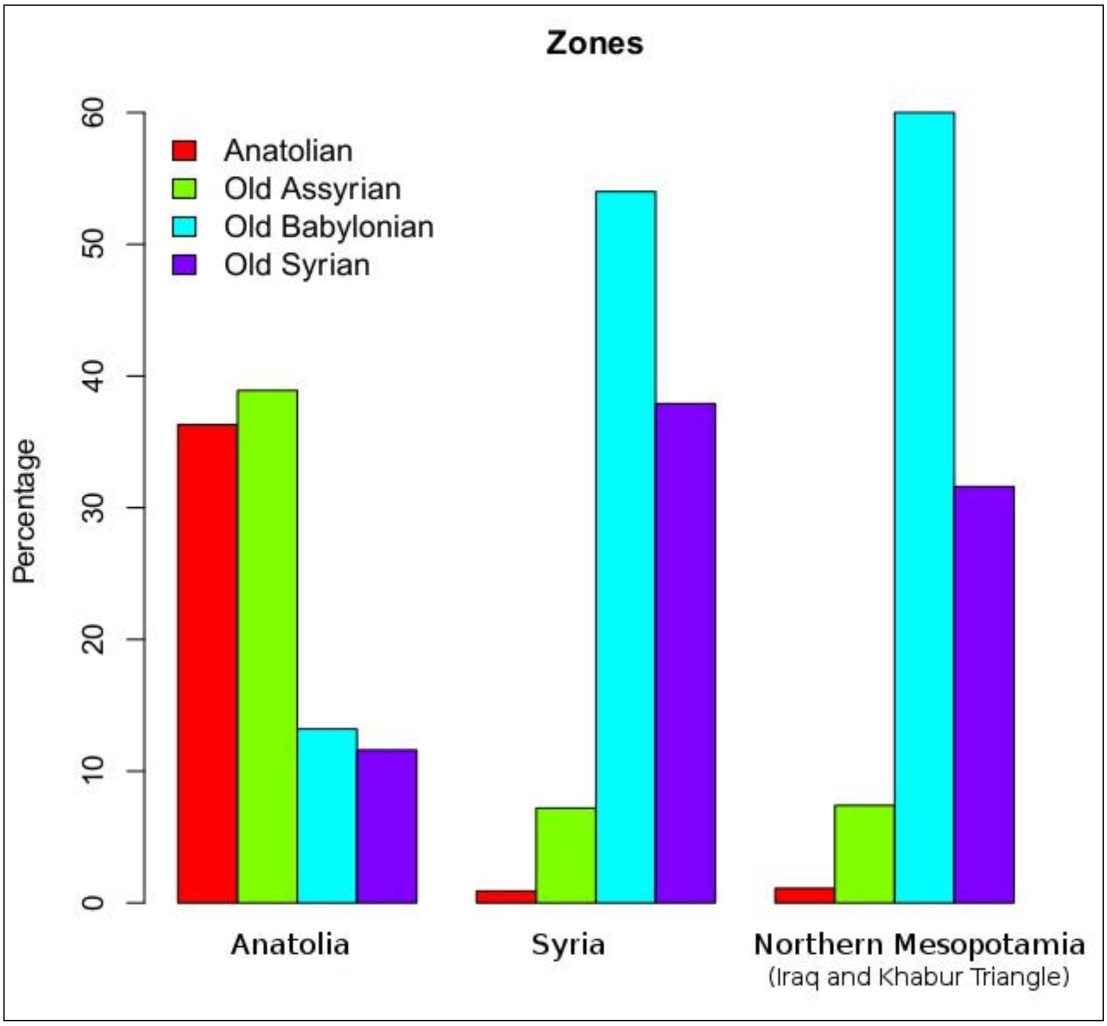

Figure 96. Percentages of different seals/impressions styles according to the distribution zones.

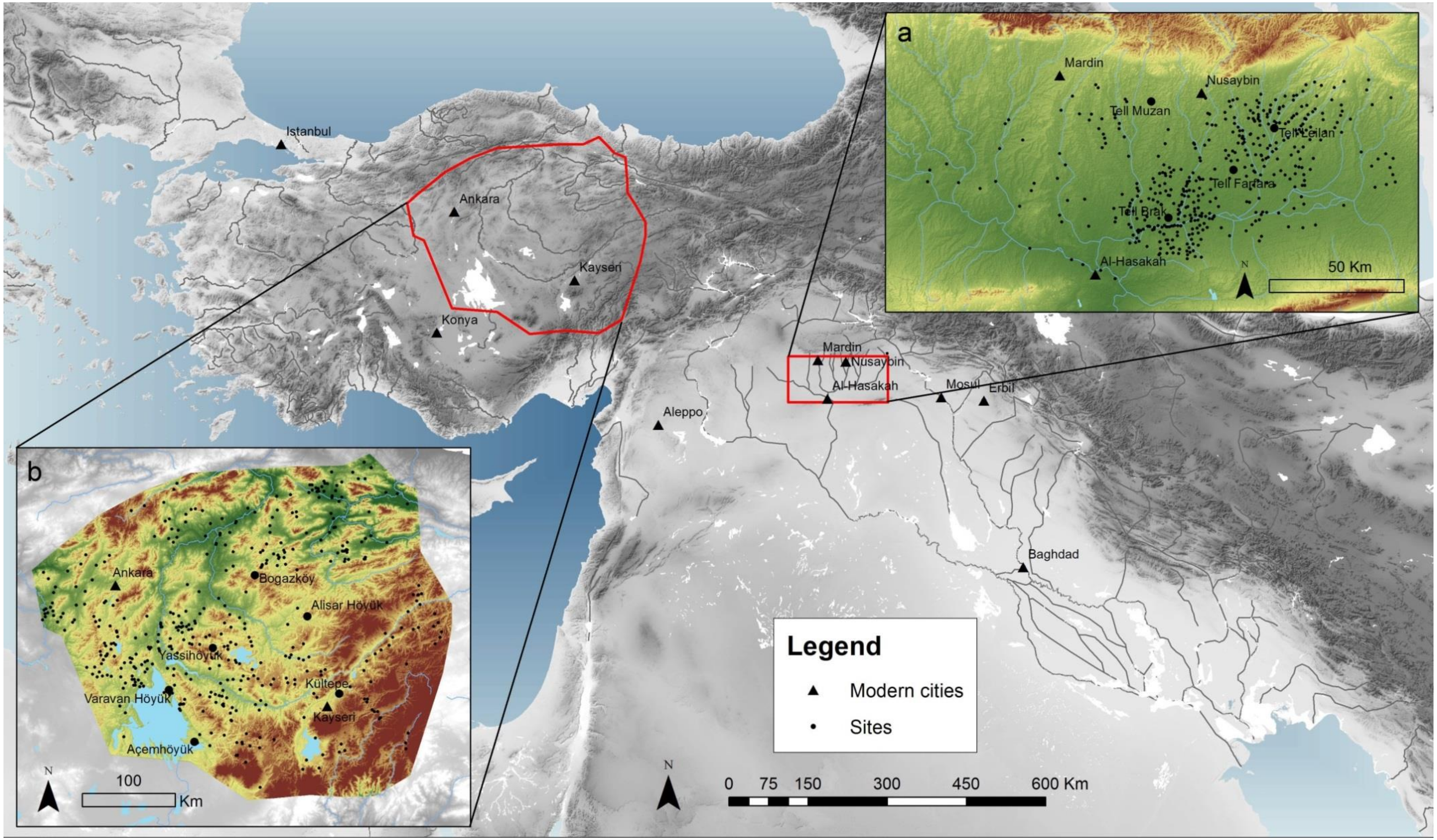

Figure 97. Map showing the two case studies: Khabur Triangle (a) and Central Anatolia (b).

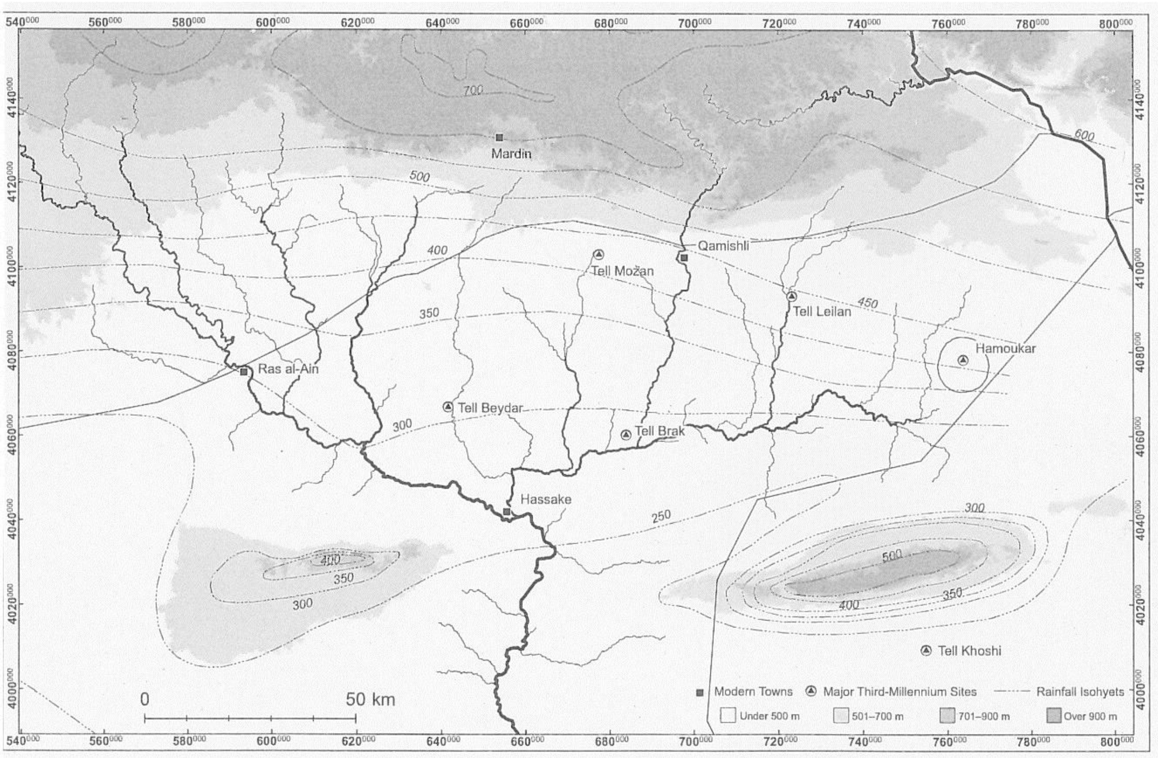

Figure 98. Rainfall in the Khabur Triangle (*After* Ur 2010b, Fig. 2.7).

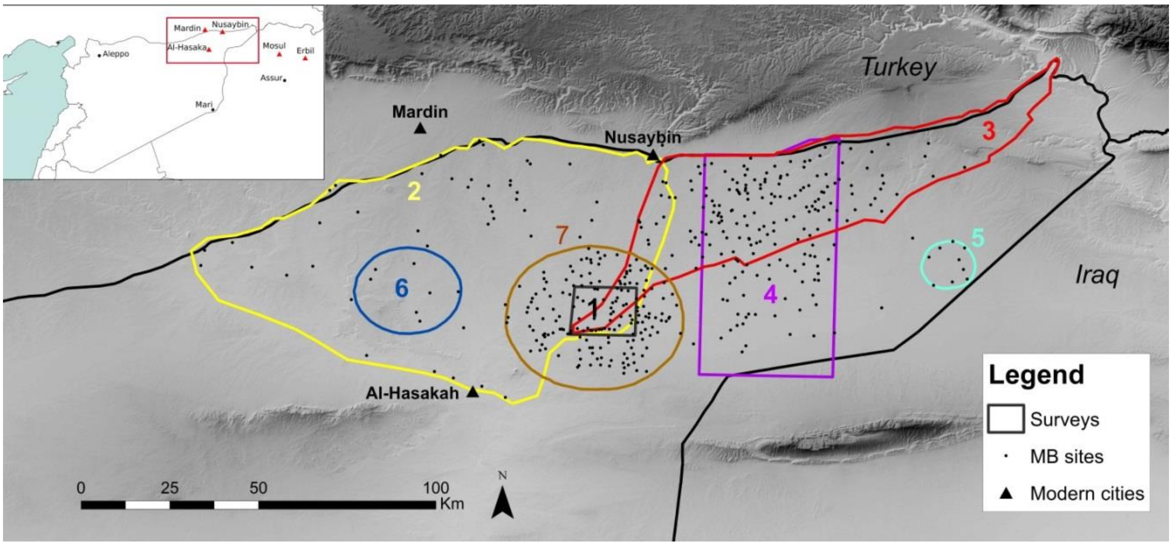

Figure 99. Map showing archaeological surveys carried out in the Khabur Triangle.

Map no.	Season	Reference	Area (sq. km)	Total n. sites	n. MB sites	Sites density (x 100 sq. km)
1	1988	Eidem and Warburton 1996	193	56	19	29.01
2	1989-1991	Lyonnet 2000	5,100	161	45	3.15
3	1976-77; 1979	Meijer 1986	2,296	290	152	12.63
4	1984; 1987, 1995; 1997	Ristvet 2005	1,919	335	157	17.45
5	1999-2001	Ur 2010b	127	60	9	47.24
6	1997-98	Ur and Wilkinson 2008	454	83	7	18.28
7	2002-2003	Wright *et al.* 2006-2007	1,275	268	74	21.01

Figure 100. List of archaeological surveys in the Khabur Triangle.

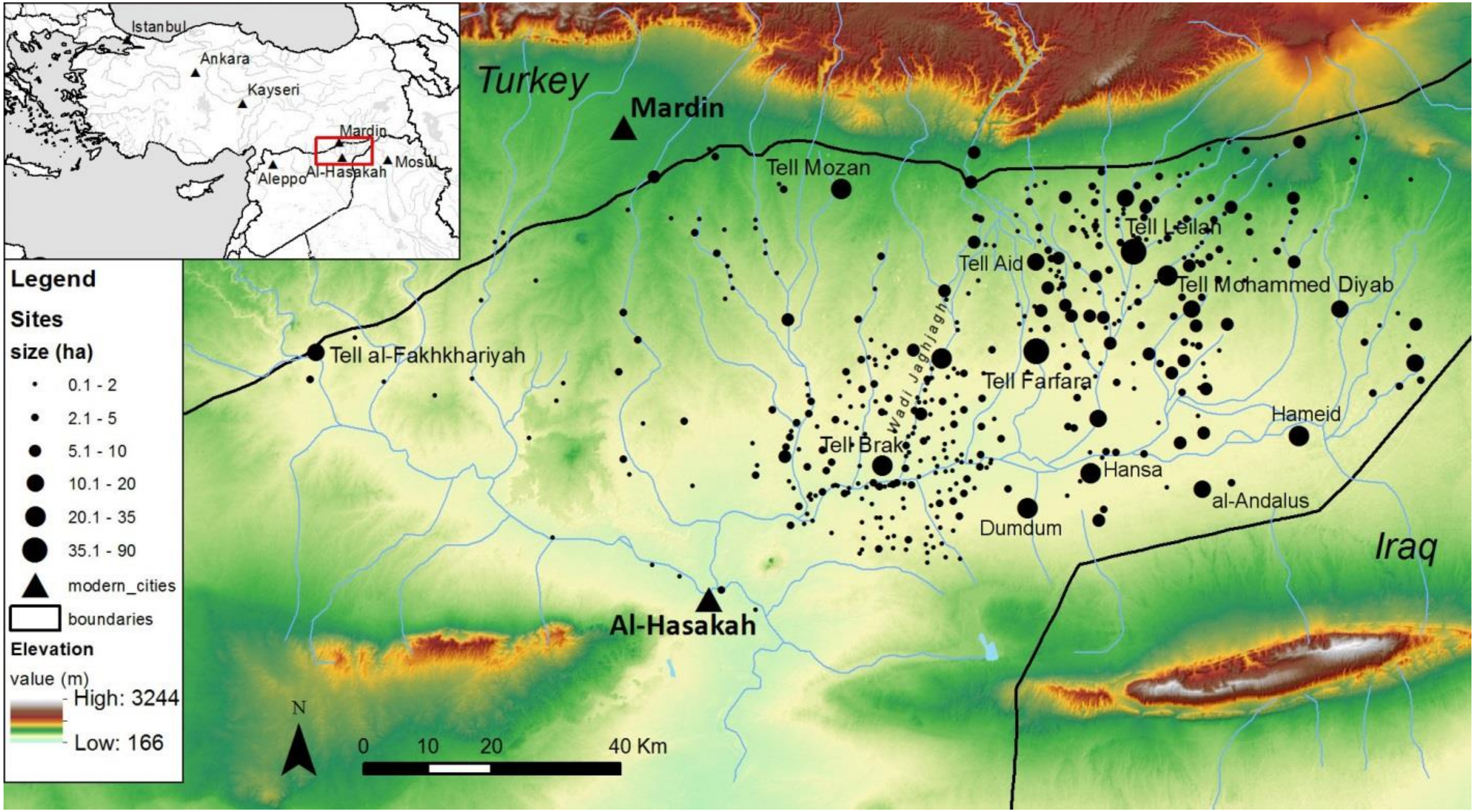

Figure 101. Spatial distribution and estimated sizes of Middle Bronze Age sites in the Khabur Triangle.

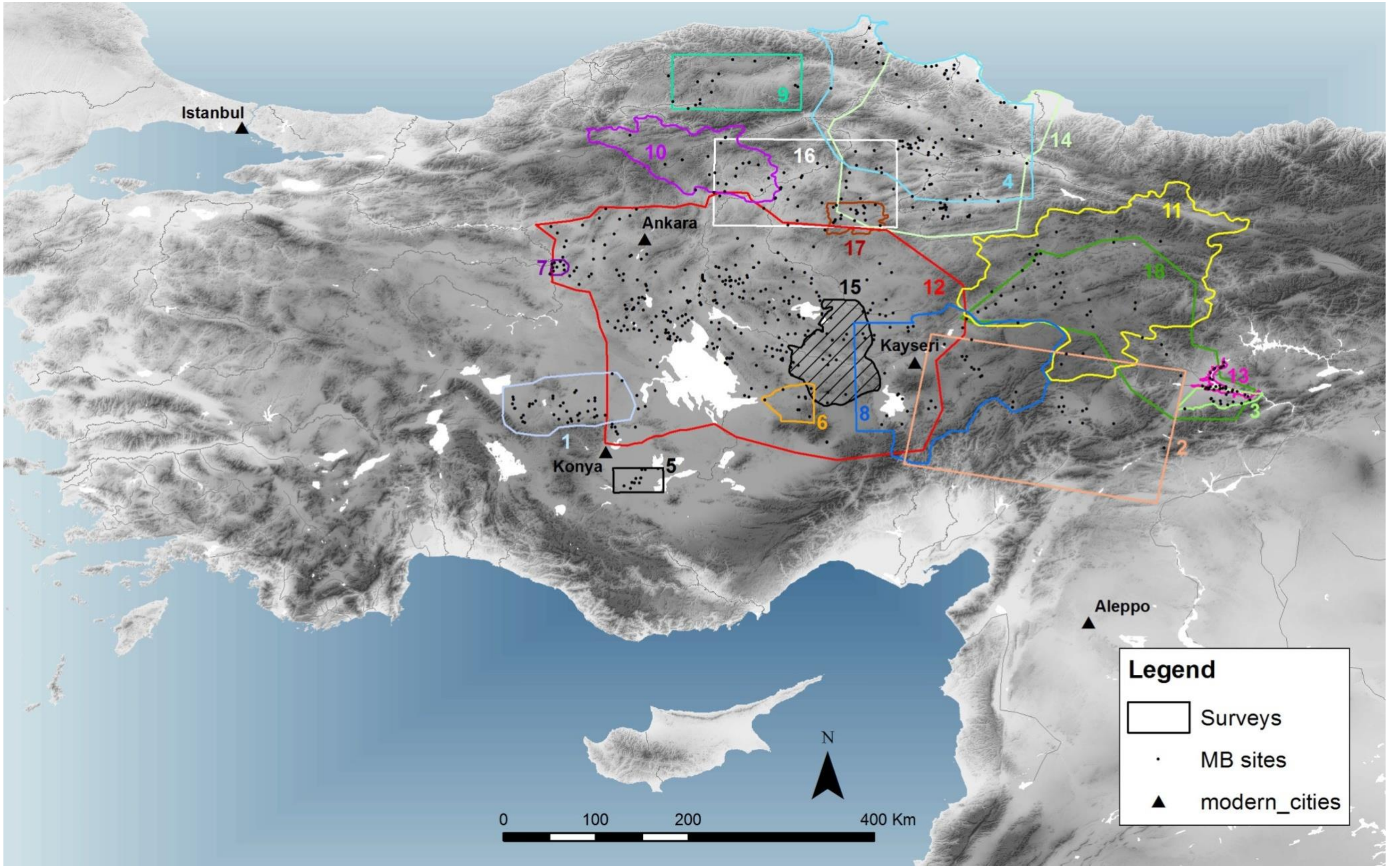

Figure 102. Map showing archaeological surveys carried out in central Anatolia.

Map no.	Season	Reference	Area (sq. km)	Total no. sites	no. MB sites	Sites density (x 100 sq. km)
1	2000	Bahar 2002	5,825	120	52	2.06
2	1962,1965	Brown 1967	31,349	38	14	0.12
3	2005	Di Nocera 2008-09	1,034	82	29	7.93
4	1997-99	Dönmez 1999-2000, 2002	23,408	85	32	0.36
5	1958	French 1970	1,127	51	7	4.5
6	1993	Gülçur 1995	1,341	61	9	4.54
7	1996-2002	Kealhofer 2005	200	25	9	12.5
8	2008-10	Kulakoğlu *et al.* 2009 and 2011	19,194	87	43	0.45
9	1995-97	Kuzucuoğlu *et al.* 1997; Marro *et al.* 1998; Özdoğan *et al.* 1997, 1999, and 2000	6,189	91	14	1.47
10	1997-2001	Matthews and Glatz 2009	7,737	337	19	4.35
11	1992-95, 97-99; 2007	Ökse 1994-97, 1999-2001; Engin 2009	27,789	476	31	1.71
12	1990	Omura 1992	58,847	53	36	0.09
	1991	Omura 1993	6,899	30	11	0.43
	1992-93	Omura 1994 and 1995	4,322	102	48	2.36
	1994	Omura 1996a-b	12,143	54	25	0.44
	1995	Omura 1997	1,634	43	12	2.75
	1996	Omura 1998	1,037	51	8	4.91
	1999-2000	Omura 2000 and 2001a	6,152	66	18	1.07
	2000	Omura 2001b	2,057	64	18	3.11
	2001	Omura 2002	4,555	68	33	1.49
	2002	Omura 2003	1,786	106	10	5.95
	2005	Omura 2006	2,672	46	13	1.72
	2006	Omura 2007a	3,529	40	13	1.13
	2003-06	Omura 2007b	7,988	190	56	2.39
	2007	Omura 2008	1,435	53	20	3.69
13	1975-76	Özdoğan 1977	369	80	24	21.68
14	1989, 1995-98, 2001-05, 2007	Özsait 1991,1998-2000, 2002-07, 2009; Özsait and Özsait 2001	26,454	411	26	1.55
15	1997-98	Senyurt 1998 and 1999	5,804	53	16	0.91
16	1996-1997, 2002,2006	Sipahi and Yildirim 1999-2000, 2004, 2008	13,964	66	20	0.47
17	1988-89	Süel 1989 and 1990	1,440	28	9	1.94
18	1977	Yakar and Gürsan-Salzmann 1979	21,370	68	15	0.31

Figure 103. List of archaeological surveys in central Anatolia.

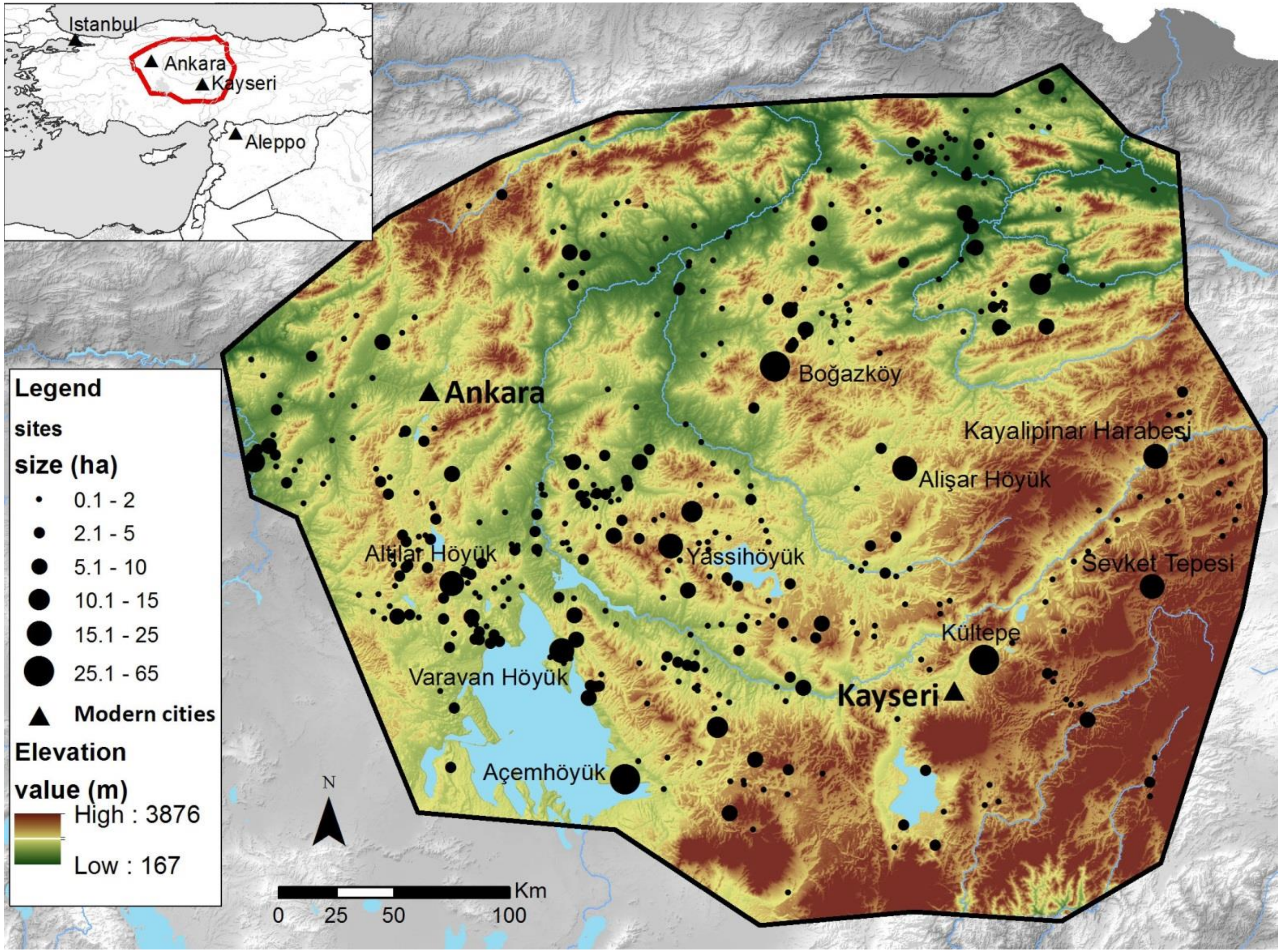

Figure 104. Spatial distribution and estimated sizes of Middle Bronze Age sites in central Anatolia.

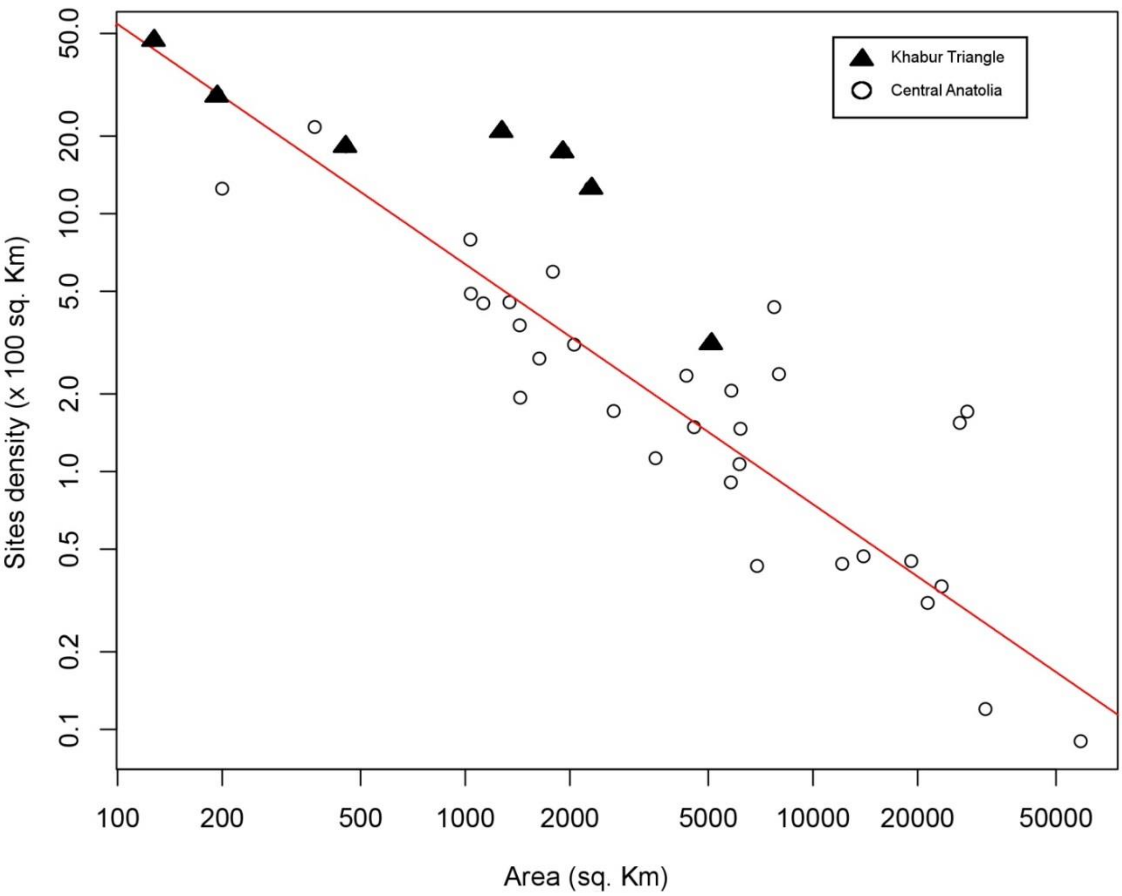

Figure 105. Linear regression model of sites density vs. archaeological survey area.

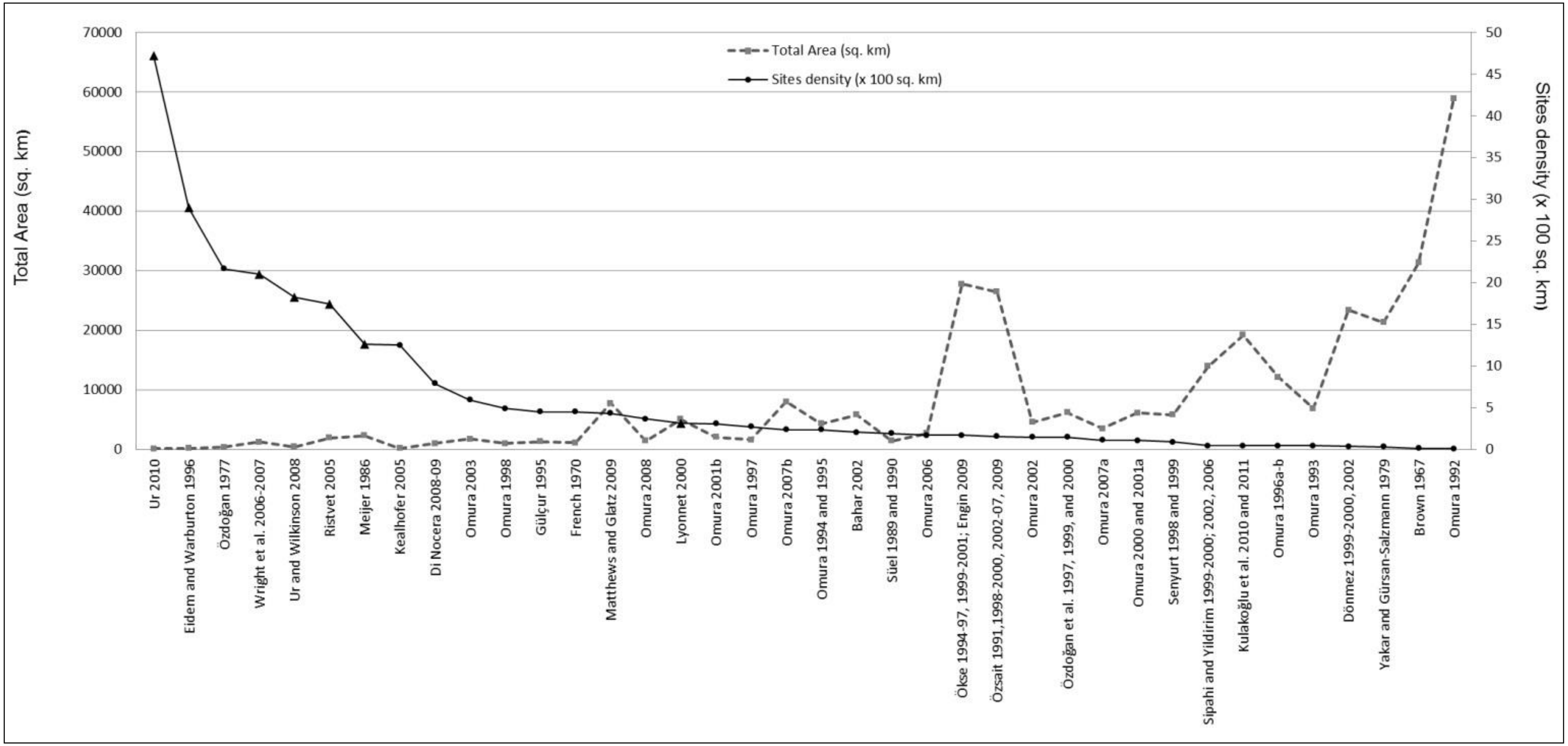

Figure 106. Recovery rates for archaeological surveys carried out in the Khabur Triangle and in central Anatolia. The triangle markers indicate the Khabur Triangle's surveys.

Rank	Season	Reference	Area (sq. Km)	Total no. sites	no. MB sites	Sites density (x 100 sq. km)
1	1999-2001	Ur 2010b	127	60	9	47.24
2	1988	Eidem and Warburton 1996	193	56	19	29.01
3	1975-76	Özdoğan 1977	369	80	24	21.68
4	2002-2003	Wright et al. 2006-2007	1,275	268	74	21.01
5	1997-98	Ur and Wilkinson 2008	454	83	7	18.28
6	1984; 1987, 1995; 1997	Ristvet 2005	1,919	335	157	17.45
7	1976-77; 1979	Meijer 1986	2,296	290	152	12.63
8	1996-2002	Kealhofer 2005	200	25	9	12.50
9	2005	Di Nocera 2008-09	1,034	82	29	7.93
10	2002	Omura 2003	1,786	106	10	5.95
11	1996	Omura 1998	1,037	51	8	4.91
12	1993	Gülçur 1995	1,341	61	9	4.54
13	1958	French 1970	1,127	51	7	4.50
14	1997-2001	Matthews and Glatz 2009	7,737	337	19	4.35
15	2007	Omura 2008	1,435	53	20	3.69
16	1989-1991	Lyonnet 2000	5,100	161	45	3.15
17	2000	Omura 2001b	2,057	64	18	3.11
18	1995	Omura 1997	1,634	43	12	2.75
19	2003-06	Omura 2007b	7,988	190	56	2.39
20	1992-93	Omura 1994 and 1995	4,322	102	48	2.36
21	2000	Bahar 2002	5,825	120	52	2.06
22	1988-89	Süel 1989 and 1990	1,440	28	9	1.94
23	2005	Omura 2006	2,672	46	13	1.72
24	1992-95, 97-99; 2007	Ökse 1994-97, 1999-2001; Engin 2009	27,789	476	31	1.71
25	1989, 1995-98, 2001-05, 2007	Özsait 1991,1998-2000, 2002-07, 2009; Özsait and Özsait 2001	26,454	411	26	1.55
26	2001	Omura 2002	4,555	68	33	1.49
27	1995-97	Kuzucuoğlu et al. 1997; Marro et al. 1998; Özdoğan et al. 1997, 1999, and 2000	6,189	91	14	1.47
28	2006	Omura 2007a	3,529	40	13	1.13
29	1999-2000	Omura 2000 and 2001a	6,152	66	18	1.07
30	1997-98	Senyurt 1998 and 1999	5,804	53	16	0.91
31	1996-1997, 2002, 2006	Sipahi and Yildirim 1999-2000; 2004, 2008	13,964	66	20	0.47
32	2008-10	Kulakoğlu et al. 2009 - 2011	19,194	87	43	0.45
33	1994	Omura 1996a-b	12,143	54	25	0.44
34	1991	Omura 1993	6,899	30	11	0.43
35	1997-99	Dönmez 1999-2000, 2002	23,408	85	32	0.36
36	1977	Yakar and Gürsan-Salzmann 1979	21,370	68	15	0.31
37	19,621,965	Brown 1967	31,349	38	14	0.12
38	1990	Omura 1992	58,847	53	36	0.09

Figure 107. Ranking of the archaeological surveys carried out in the Khabur Triangle (highlighted) and in central Anatolia according to the sites density.

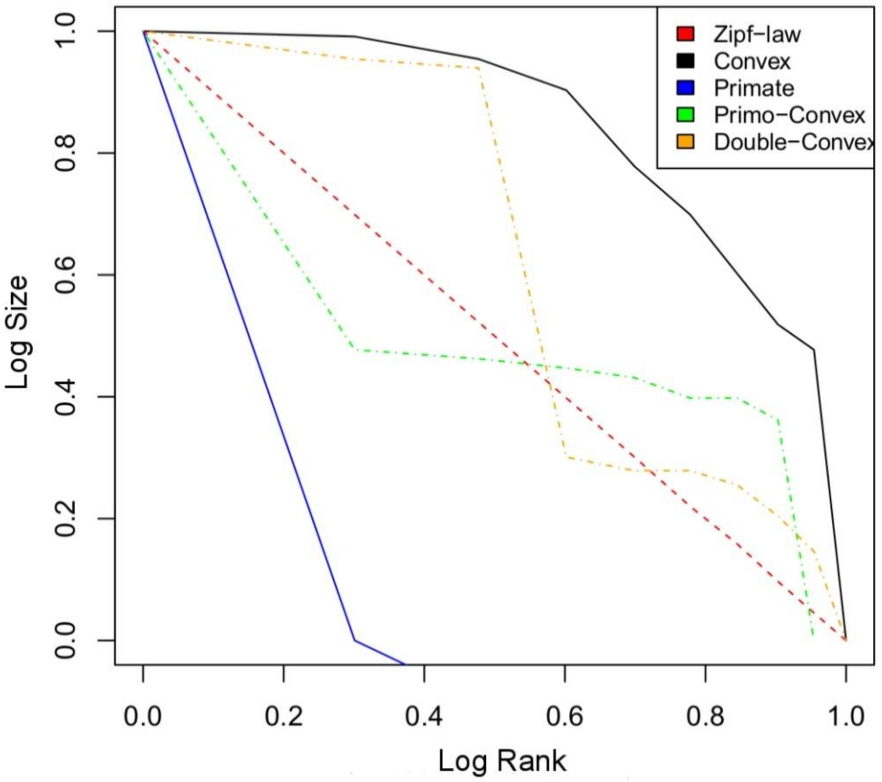

Figure 108. Different examples of rank-size curves.

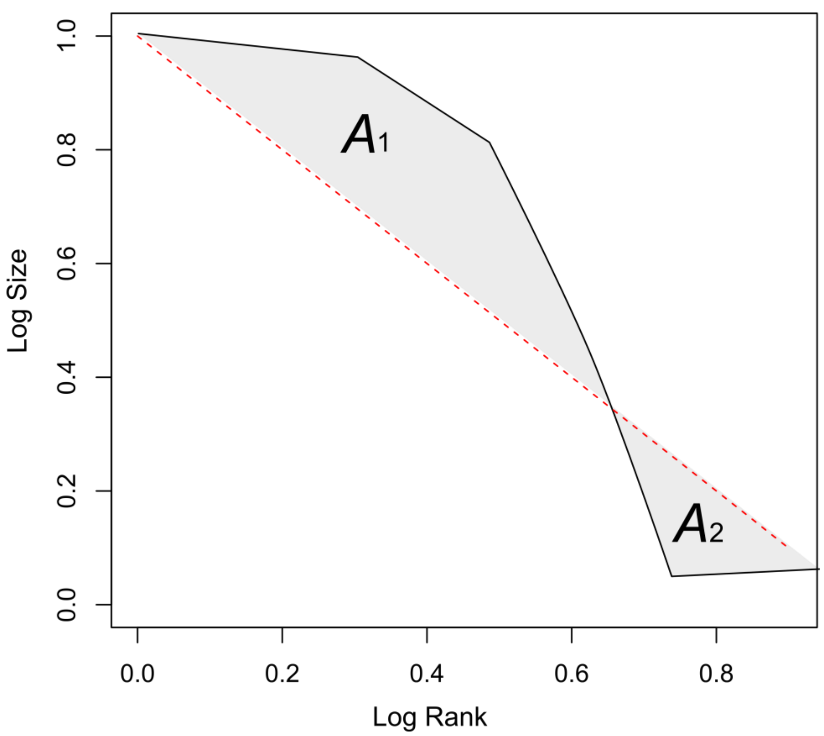

Figure 109. Areas in a rank-size graph used as positive and negative components of the coefficient A.

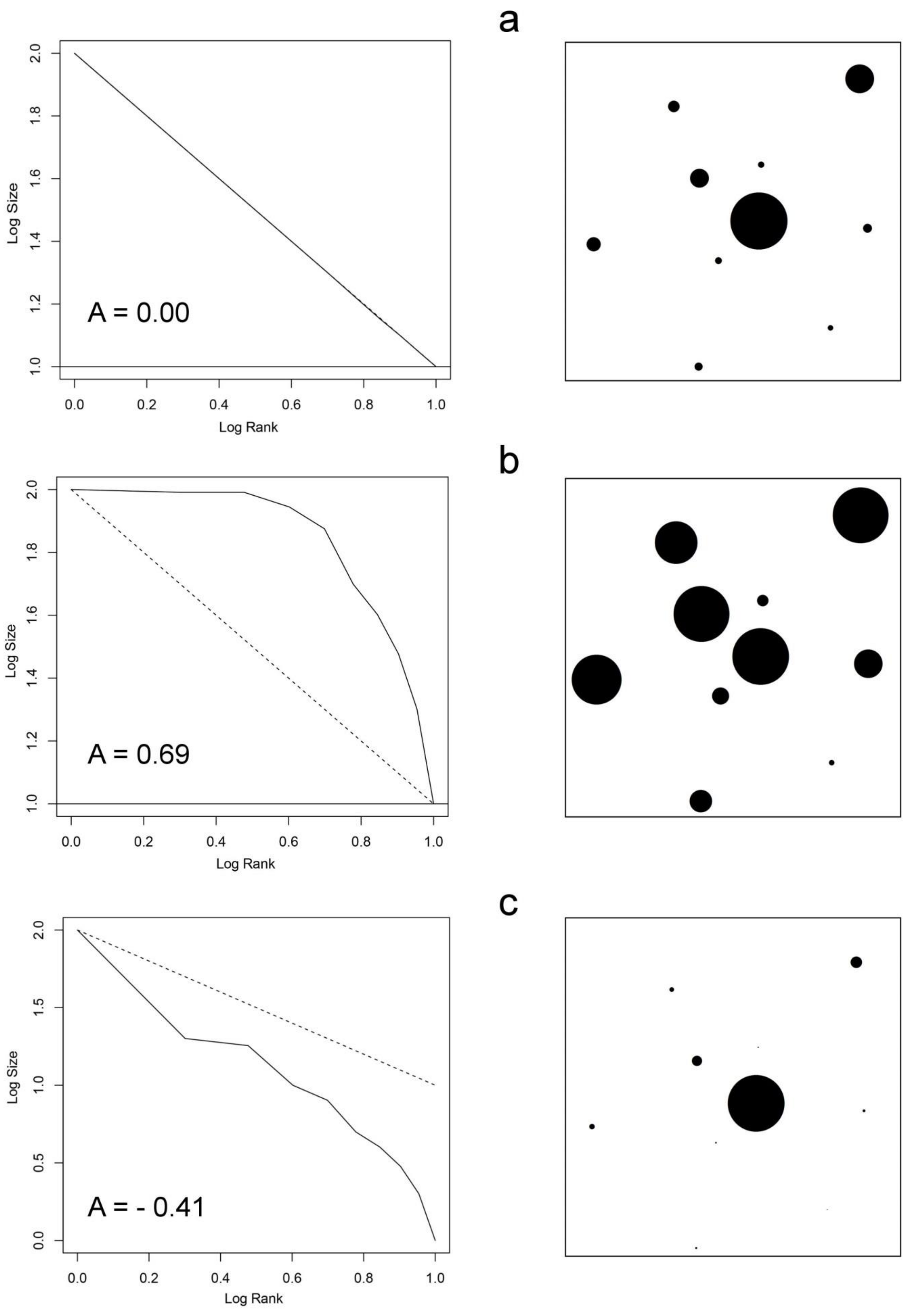

Figure 110. A-coefficient for log-normal (Zipf's Law) (a), convex (b), and primate (c) distributions. The left column shows the standardised rank-size plot, the right column shows the location of possible settlements with symbols proportional to their sizes.

Region	no. sites	minimum	1st quartile	median	mean	3rd quartile	St. dev.	maximum
Central Anatolia	440	0.1	1	1.5	2.7	2.8	5.47	65
Khabur Triangle	439	0.1	1	1.7	3.2	3.1	6.62	90

Figure 111. Summary of central tendency and dispersion of settlements size (ha) in central Anatolia and in the Khabur Triangle in the Middle Bronze Age.

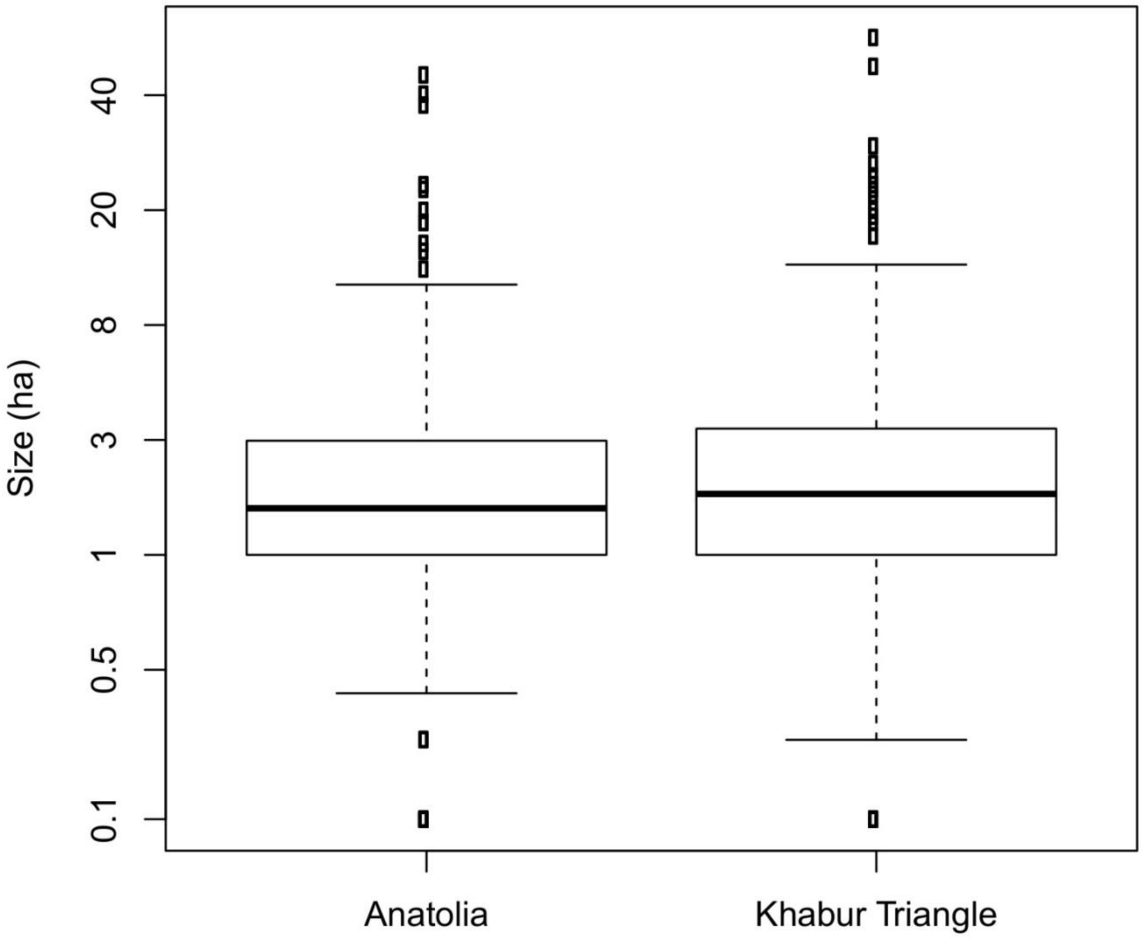

Figure 112. Box and whisker plot of size (in hectares) of Middle Bronze Age settlements in the Khabur Triangle and in central Anatolia.

Khabur Triangle	Size (ha)	Central Anatolia	Size (ha)
Tell Leilan	90	Boğazköy	65
Tell Farfara	70	Açemhöyük	55
Tell Muhammed Diyab	35	Kültepe	50
Tell Mozan	30	Sevket Tepesi	25
Dumdum	27	Yassihöyük (Kirşehir)	25
Tell Brak	25	Varavan Höyük	24
Hansa	25	Kayalipinar Harabesi	20
Hameid	23	Altilar Höyük	18
Al-Andalus	20	Alişar Höyük	18
Tell al'Id	20	Yassihöyük (Ankara)	14

Figure 113. Top ten sites in estimated size (ha) in the Khabur Triangle and in central Anatolia in the Middle Bronze Age.

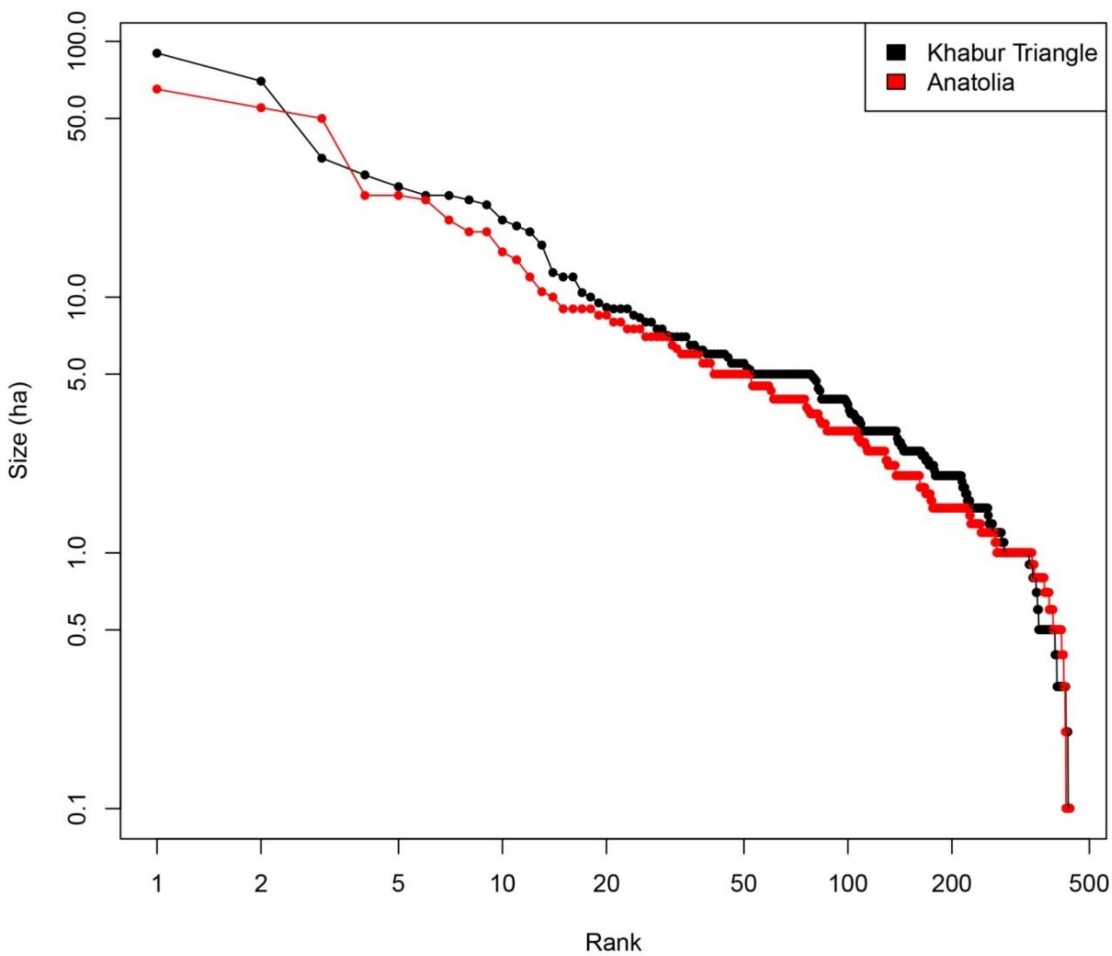

Figure 114. Site size hierarchies, using a natural logarithmic scale for size of settlements (ha) and rank (ordinal), in the Khabur Triangle and central Anatolia.

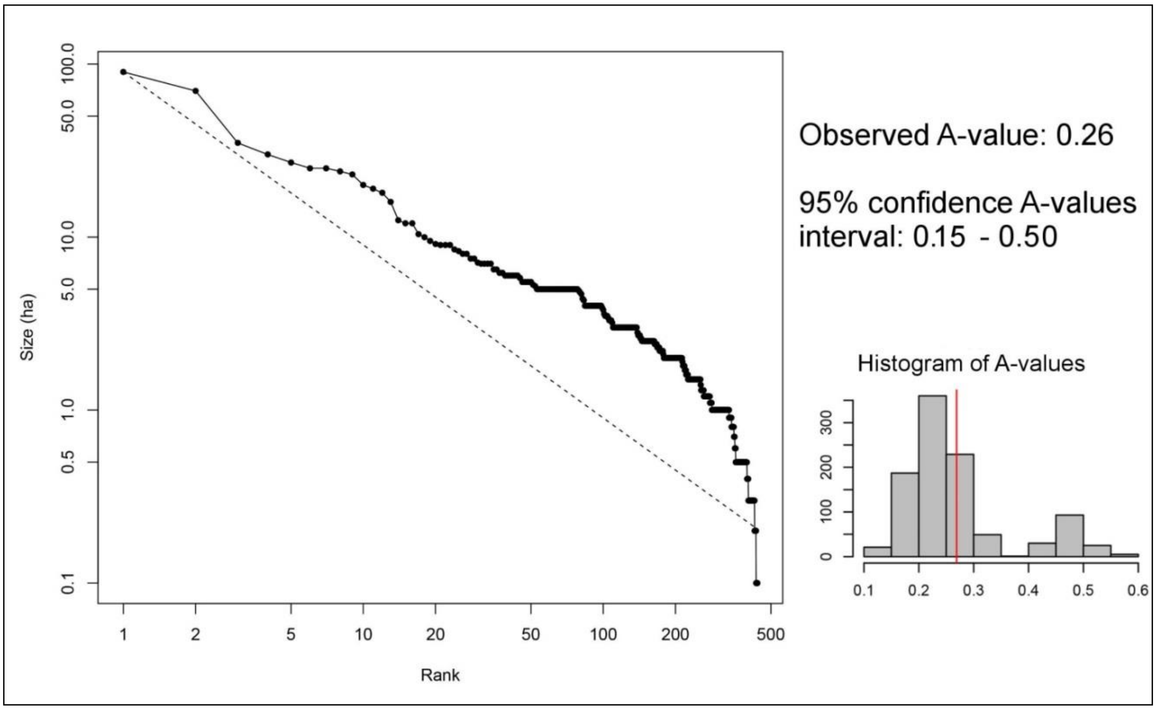

Figure 115. Rank-size graph and histogram of 1000 bootstrapped A values of the Khabur Triangle dataset.

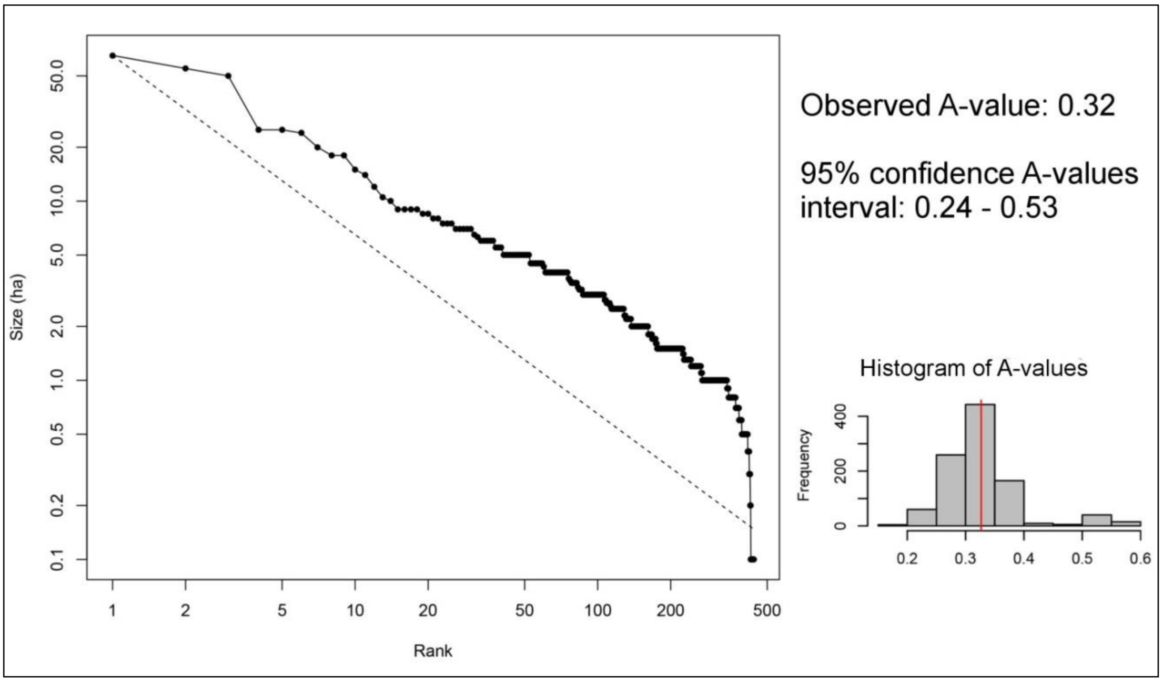

Figure 116. Rank-size graph and histogram of 1000 bootstrapped A values of central Anatolia dataset.

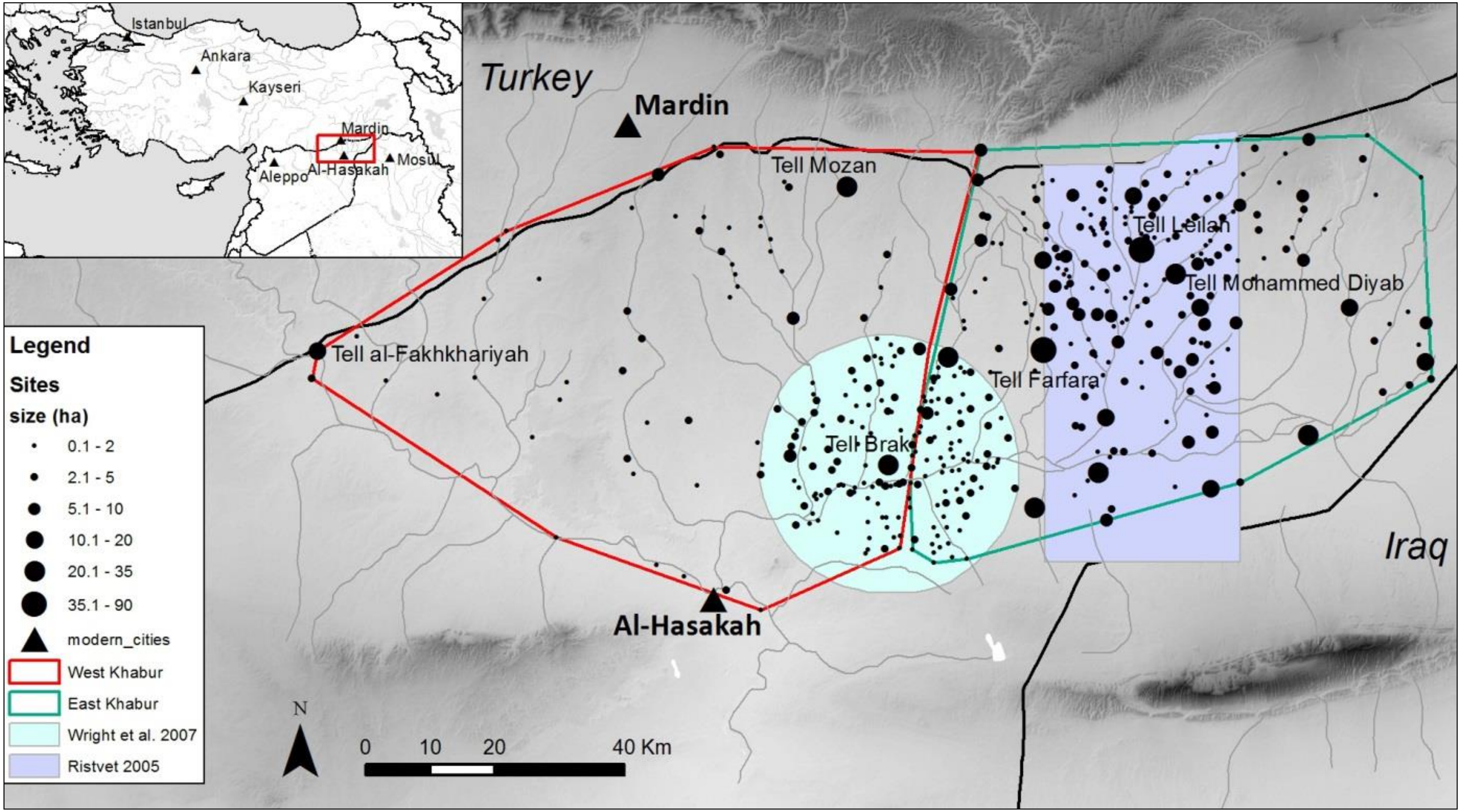

Figure 117. Spatial distribution of estimated settlements size and window analyses in the Khabur Triangle.

Region	No. sites	minimum	1st quartile	median	mean	3rd quartile	St. dev.	maximum
West Khabur Triangle	141	0.1	0.8	1.5	2.3	4	3.71	30
East Khabur Triangle	298	0.1	1	1.8	3.4	3	6.84	90

Figure 118. Summary of central tendency and dispersion of settlements size (ha) in the weastern and eastern Khabur Triangle in the Middle Bronze Age.

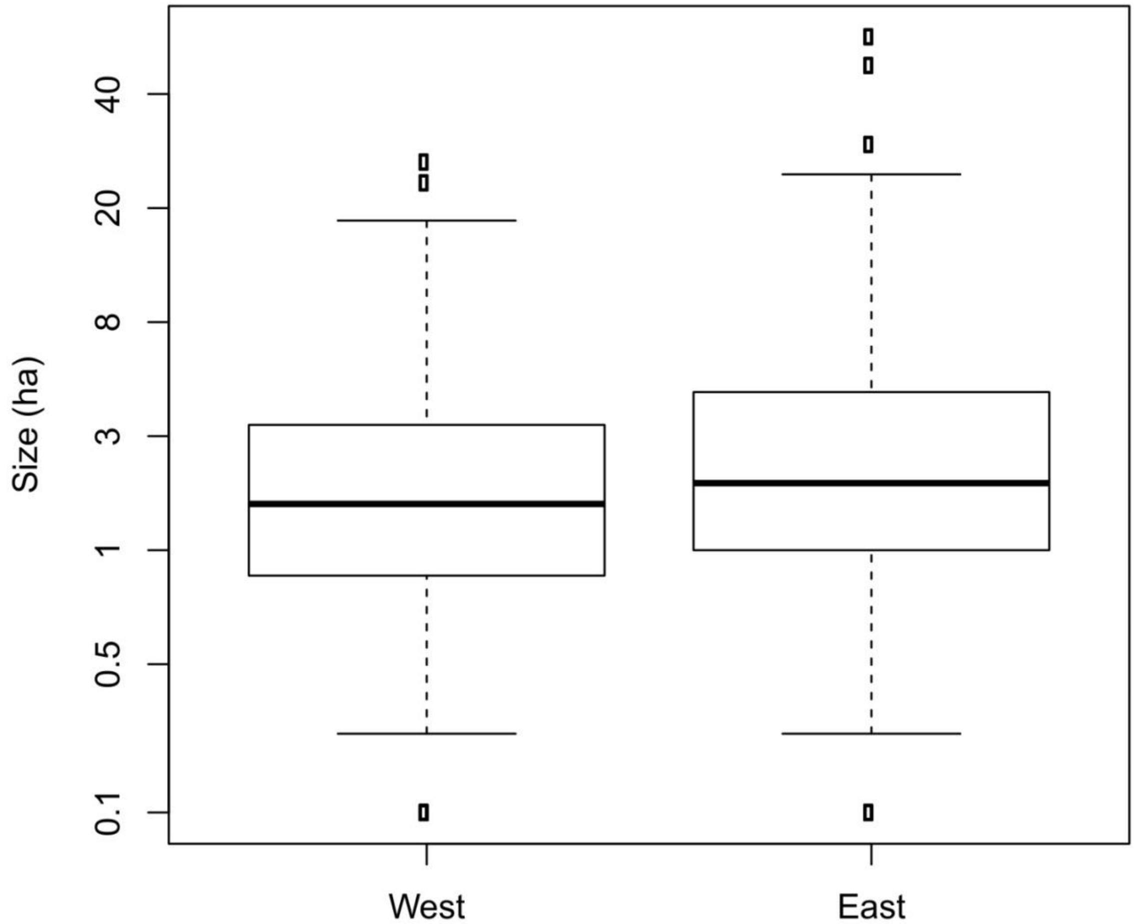

Figure 119. Box and whisker plot of size (in hectares) of Middle Bronze Age settlements in the West and East Khabur Triangle.

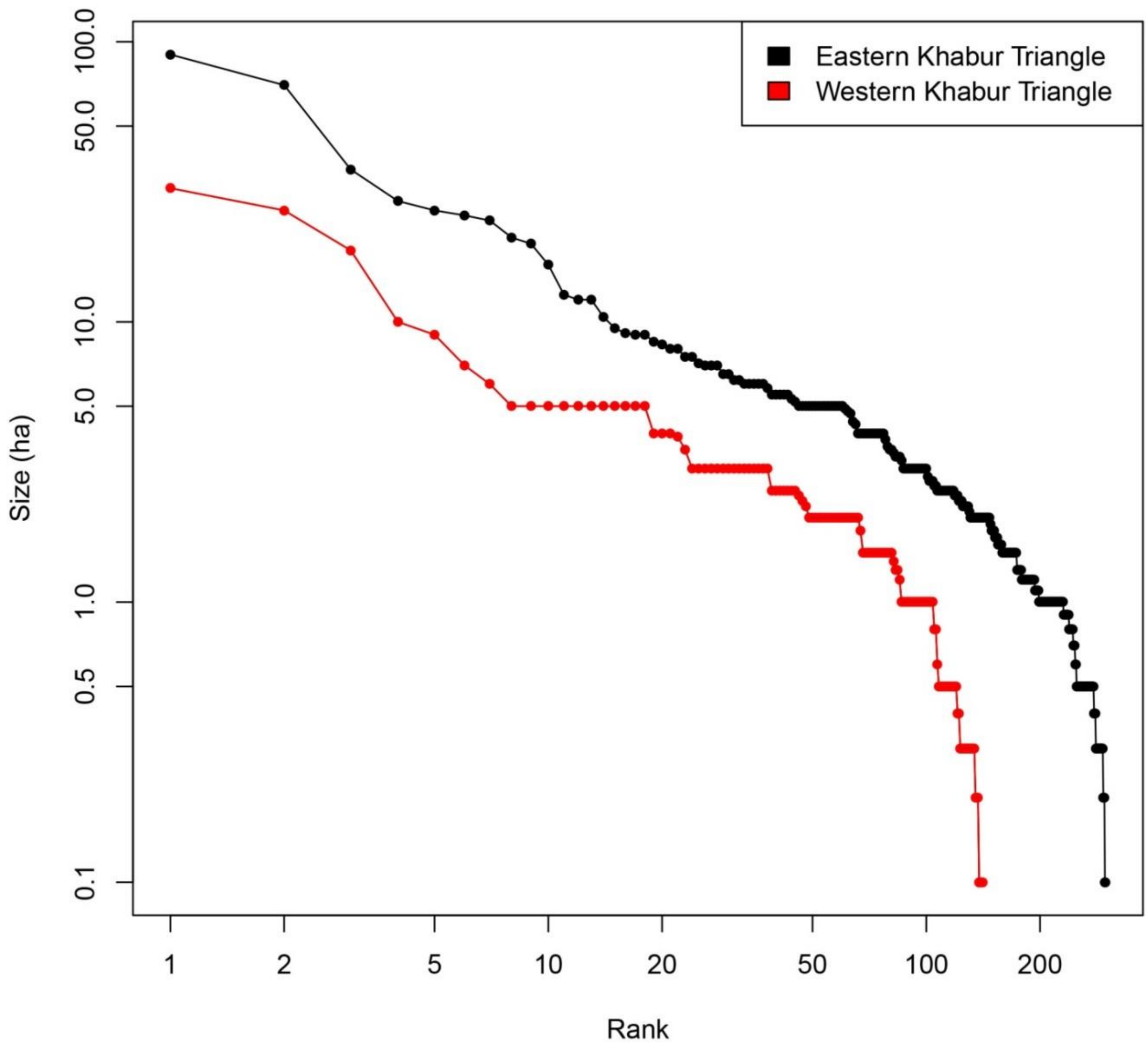

Figure 120. Site size hierarchies, using a natural logarithmic scale for size of settlements (ha) and rank (ordinal), in the West and East Khabur Triangle.

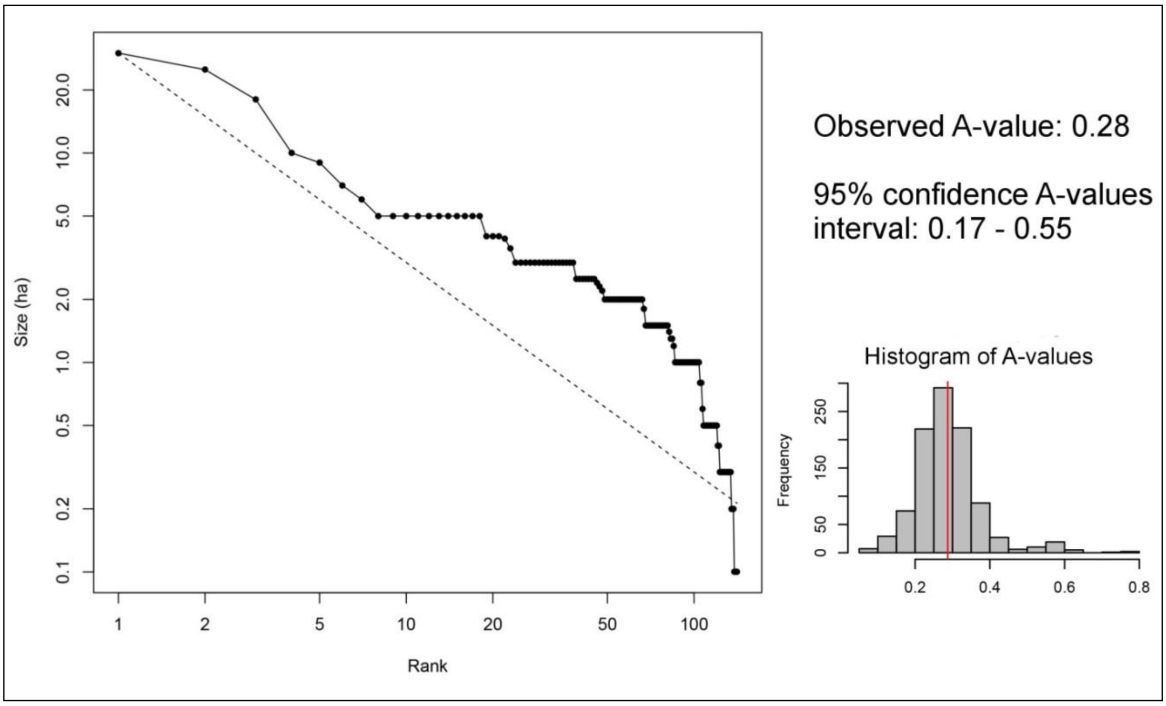

Figure 121. Rank-size graph and histogram of 1000 bootstrapped A values of the West Khabur Triangle dataset.

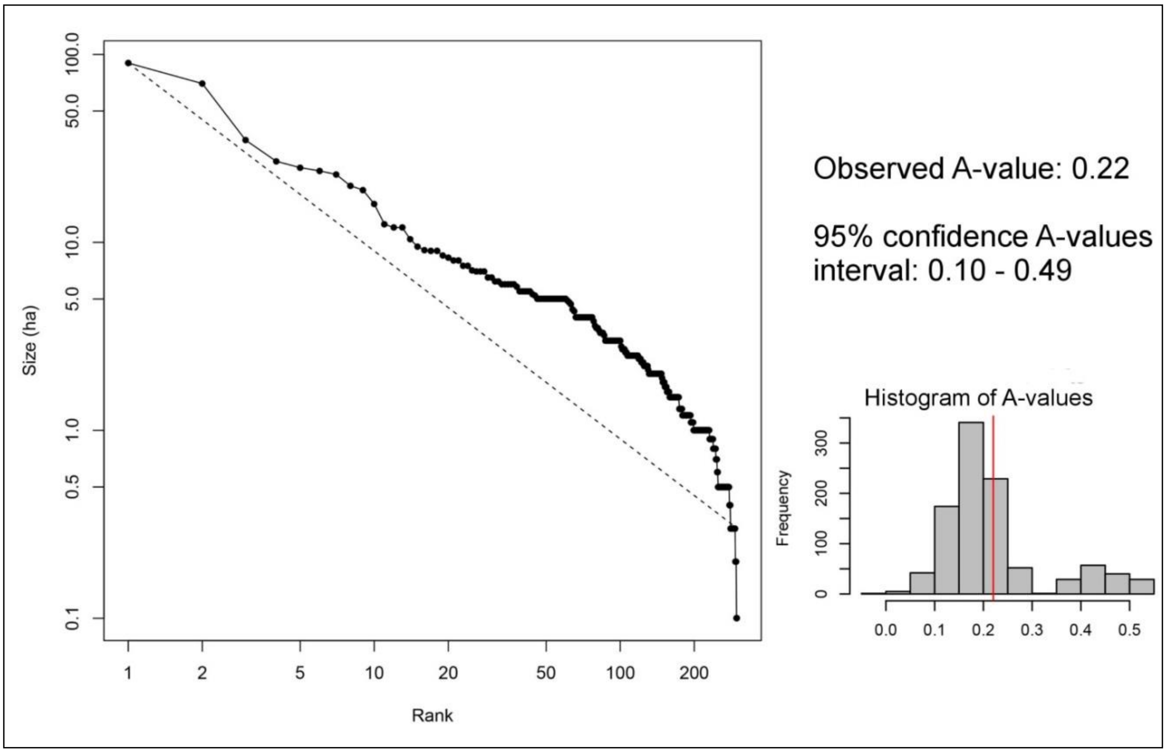

Figure 122. Rank-size graph and histogram of 1000 bootstrapped A values of the East Khabur Triangle dataset.

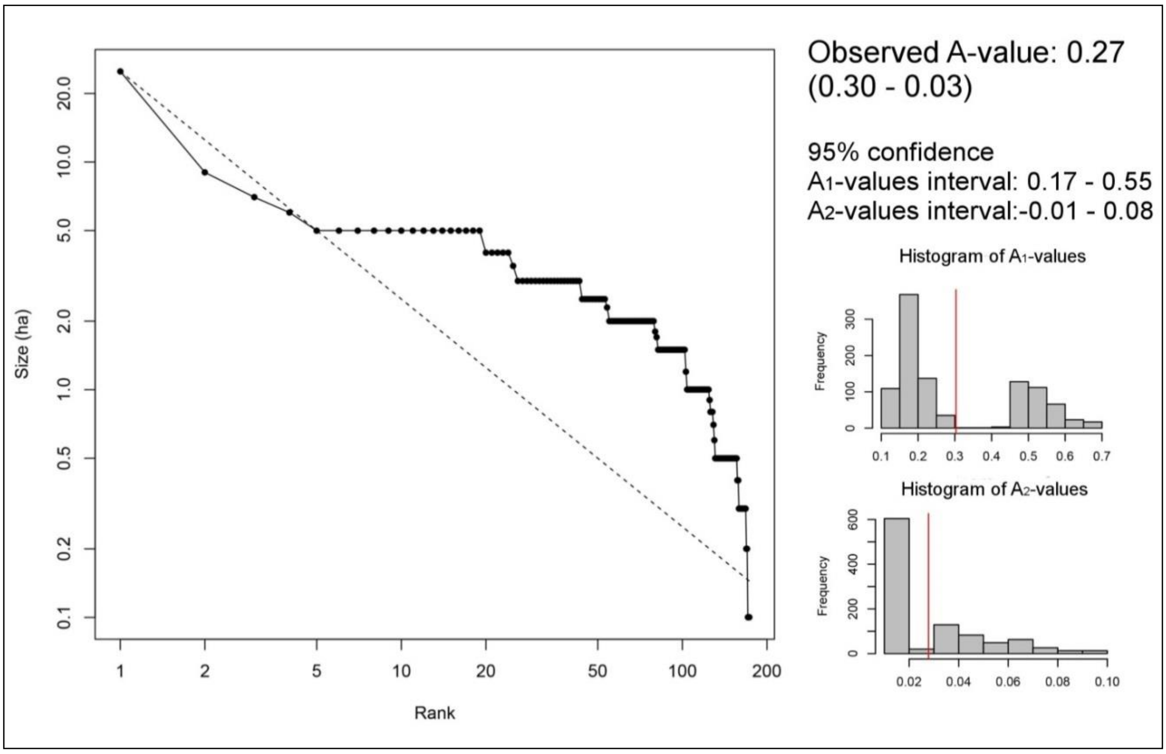

Figure 123. Rank-size graph and histogram of 1000 bootstrapped A values of the Tell Brak (Wright *et al.* 2007) dataset.

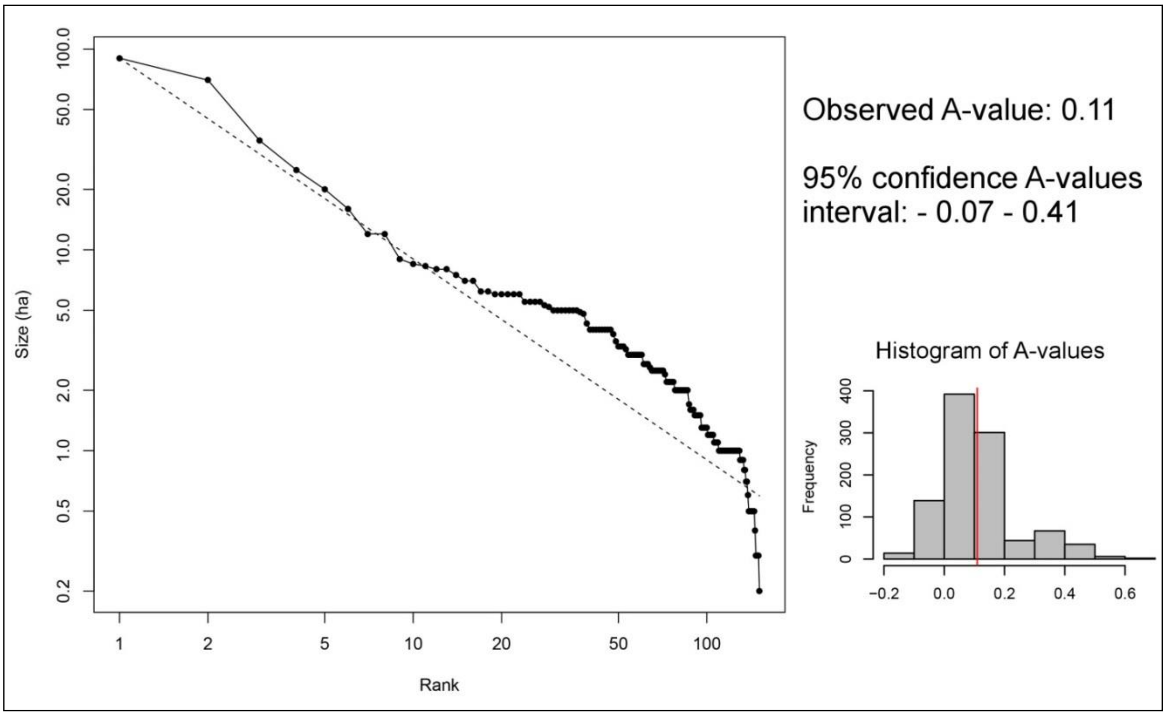

Figure 124. Rank-size graph and histogram of 1000 bootstrapped A values of the Tell Leilan (Ristvet 2005) dataset.

Region	no. sites	Largest site (approx. ha)	Observed A-coefficient	Error range (95 % confidence)	Curve Shape
West KT	298	30	0.28	0.38 (0.17 – 0.55)	Convex
East KT	141	90	0.22	0.39 (0.10 – 0.49)	Convex
Tell Brak (Wright *et al.* 2007)	173	25 - 20	0.27 = 0.30 - 0.03 (A_1 - A_2)	A_1 = 0.50 (0.12 – 0.62) A_2 = 0.07 (- 0.01 – -0.08)	Primo-Convex
Tell Leilan (Ristvet 2005)	151	90	0.11	0.34 (- 0.07 – 0.41)	Double-Convex

Figure 125. *A* values and bootstrapped error ranges for log scale rank-size curves in The Khabur Triangle (KT).

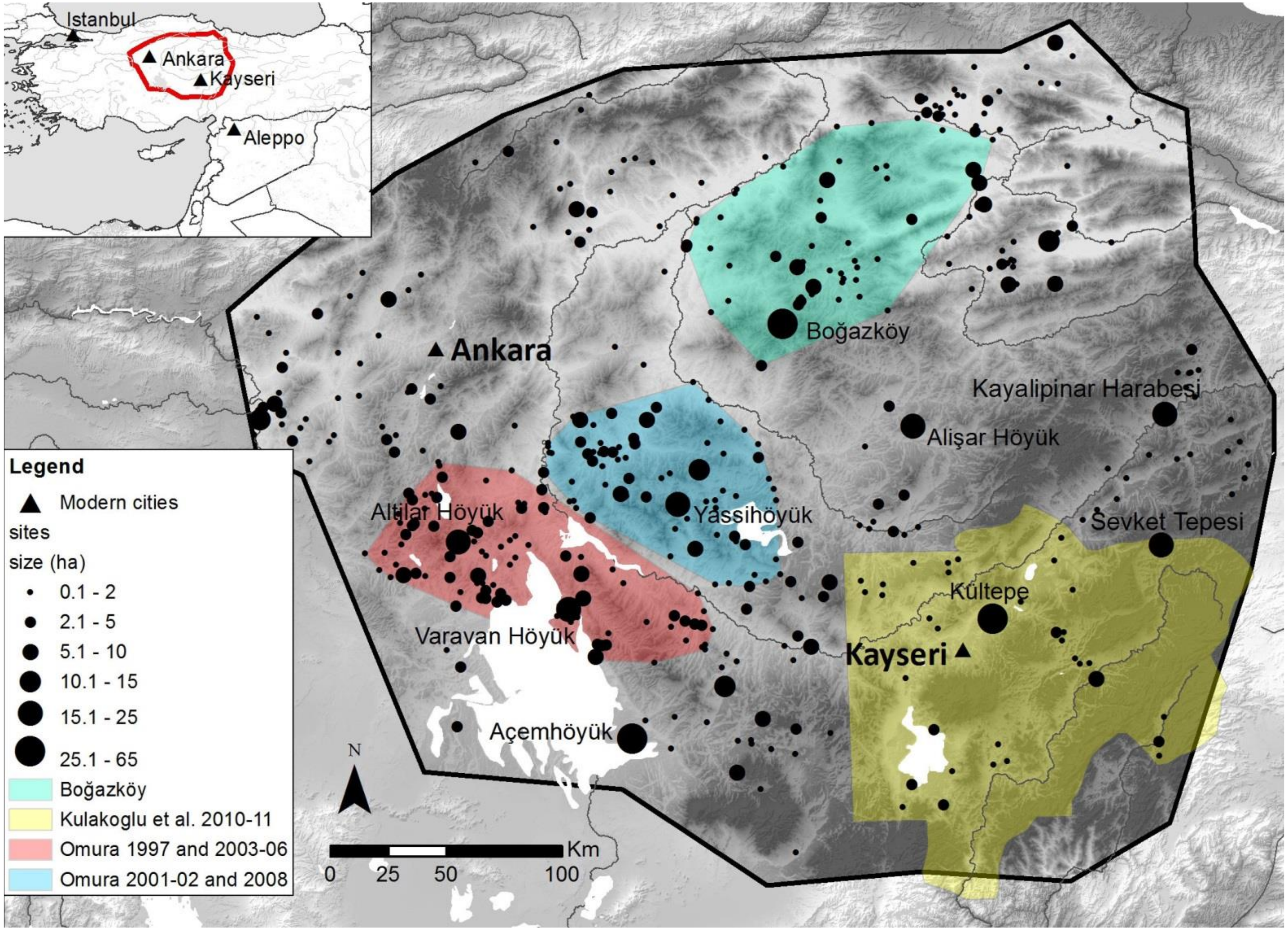

Figure 126. Spatial distribution of estimated settlements size and window analyses in central Anatolia.

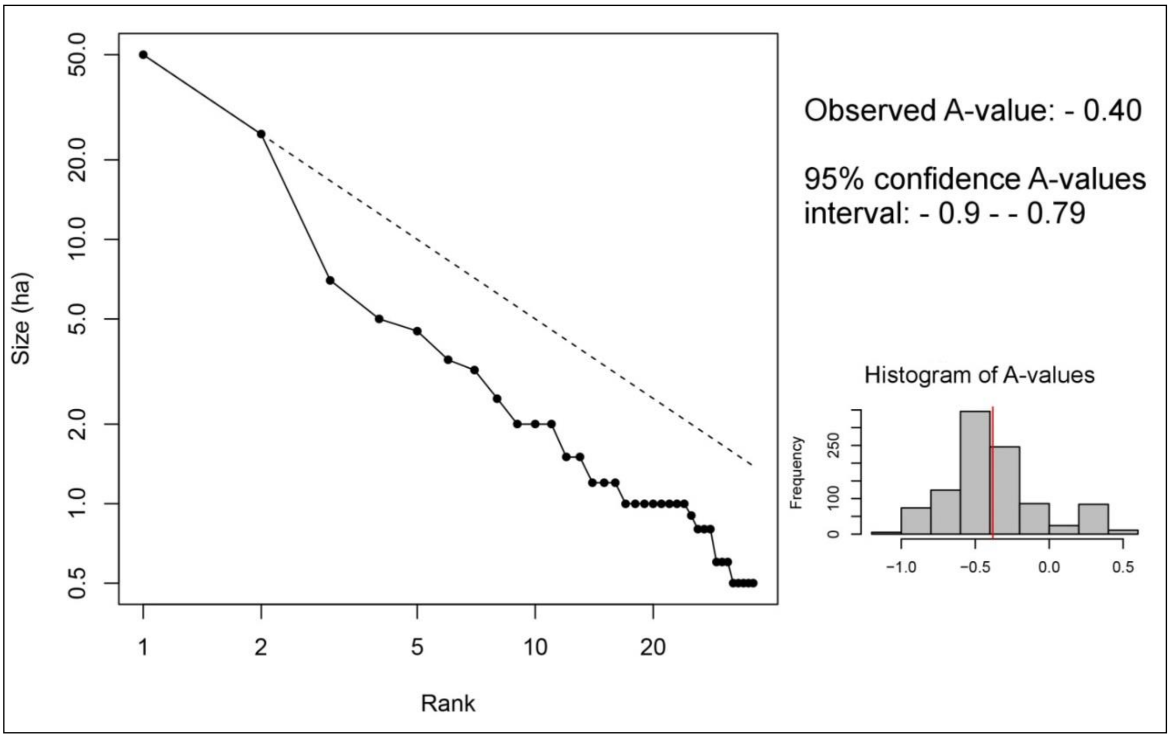

Figure 127. Rank-size graph and histogram of 1000 bootstrapped A values of the Kültepe area (Kulakoğlu *et al.* 2009-2011) dataset.

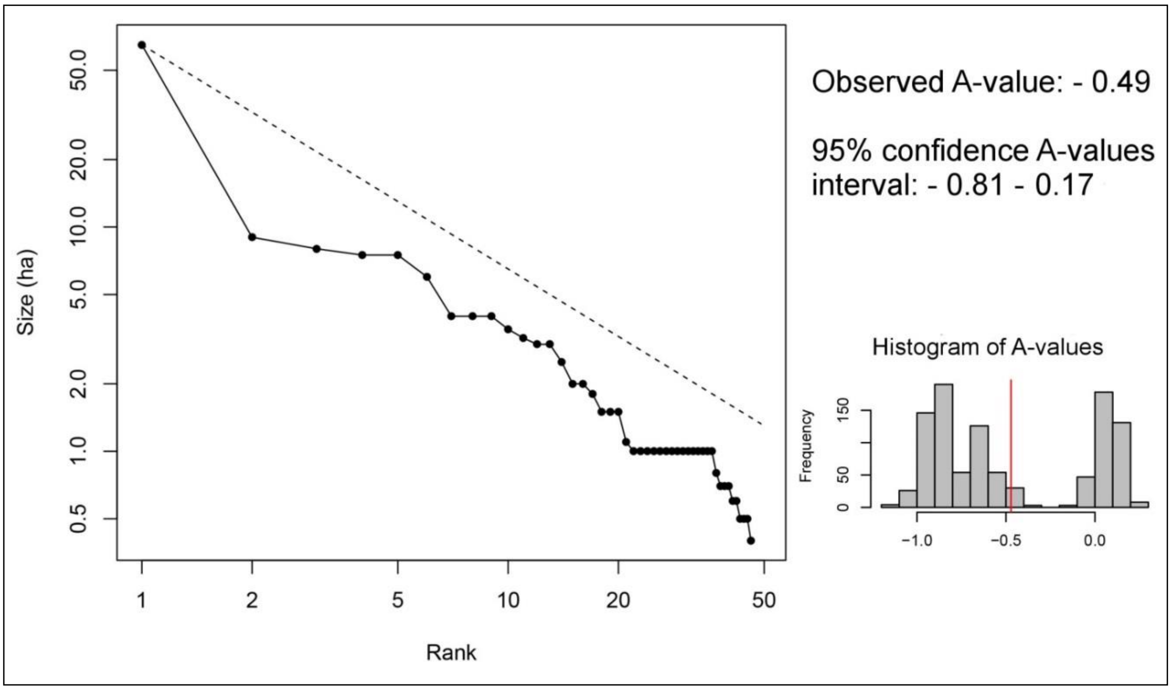

Figure 128. Rank-size graph and histogram of 1000 bootstrapped A values of the Boğazköy area dataset.

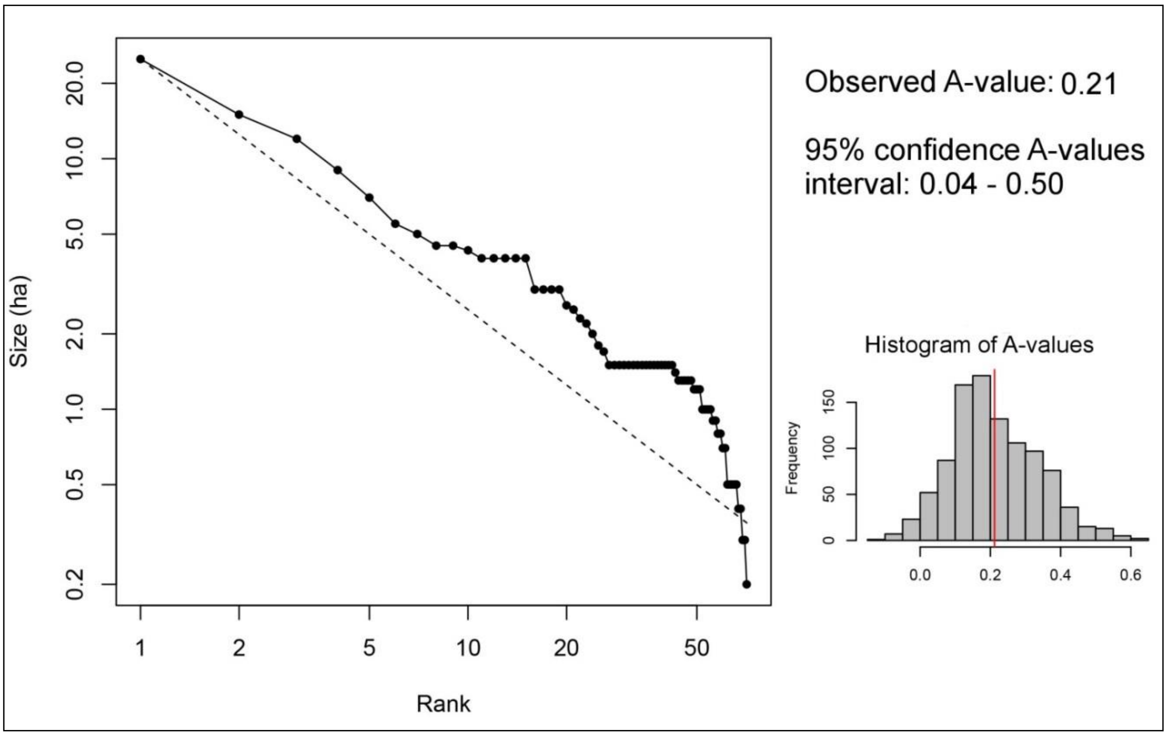

Figure 129. Rank-size graph and histogram of 1000 bootstrapped A values of the Yassihöyük area (Omura 2001-02 and 2008) dataset.

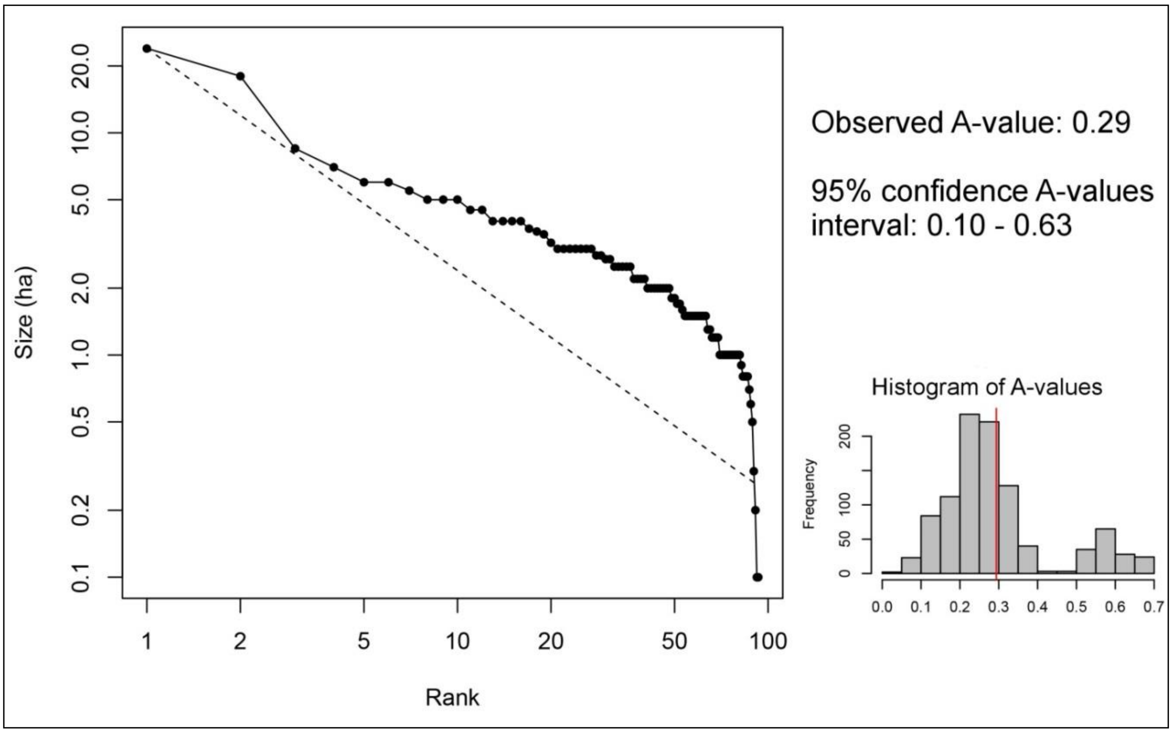

Figure 130. Rank-size graph and histogram of 1000 bootstrapped A values of the Varavan Höyük area (Omura 1997 and 2003-2007) dataset.

Region	no. sites	Largest site (approx. ha)	Observed A-coefficient	Error range (95 % confidence)	Curve Shape
Kültepe (Kulakoğlu *et al.* 2009-2011)	36	50	- 0.40	0.70 (- 0.9 – - 0.79)	Primate
Boğazköy	49	65	- 0.49	0.64 (-0.81 – 0.17)	Primate
Varavan Höyük (Omura 1997 and 2003-2007)	93	24	0.29	0.53 (0.10 – 0.63)	Double-Convex
Yassihöyük (Omura 2001-02 and 2008)	71	25	0.21	0.46 (0.04 – 0.50)	Convex

Figure 131. *A*-cofficient values and bootstrapped error ranges for log scale rank-size curves in central Anatolia.

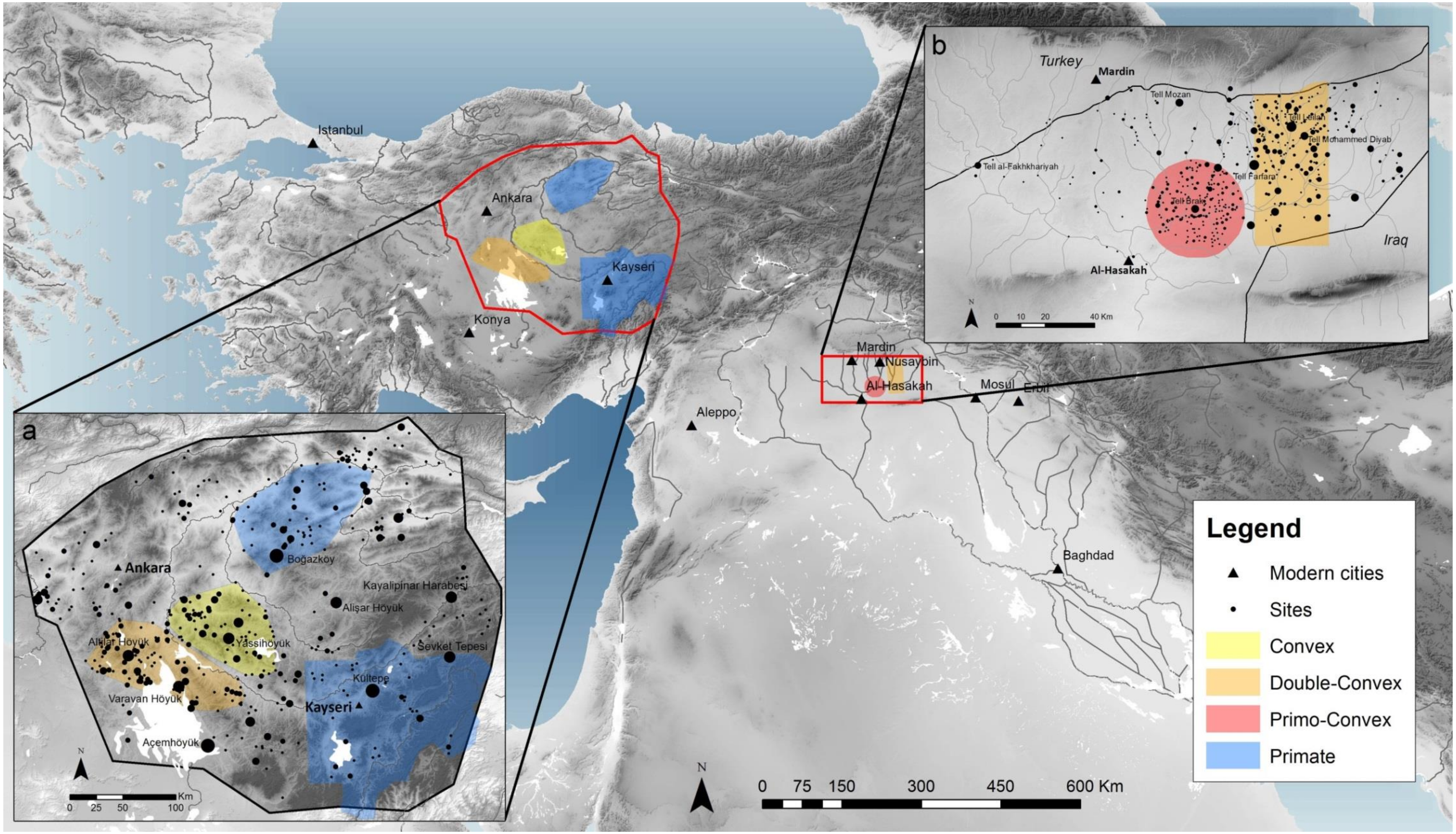

Figure 132. Spatial distribution of rank-size patterns in the Khabur Triangle and in central Anatolia.

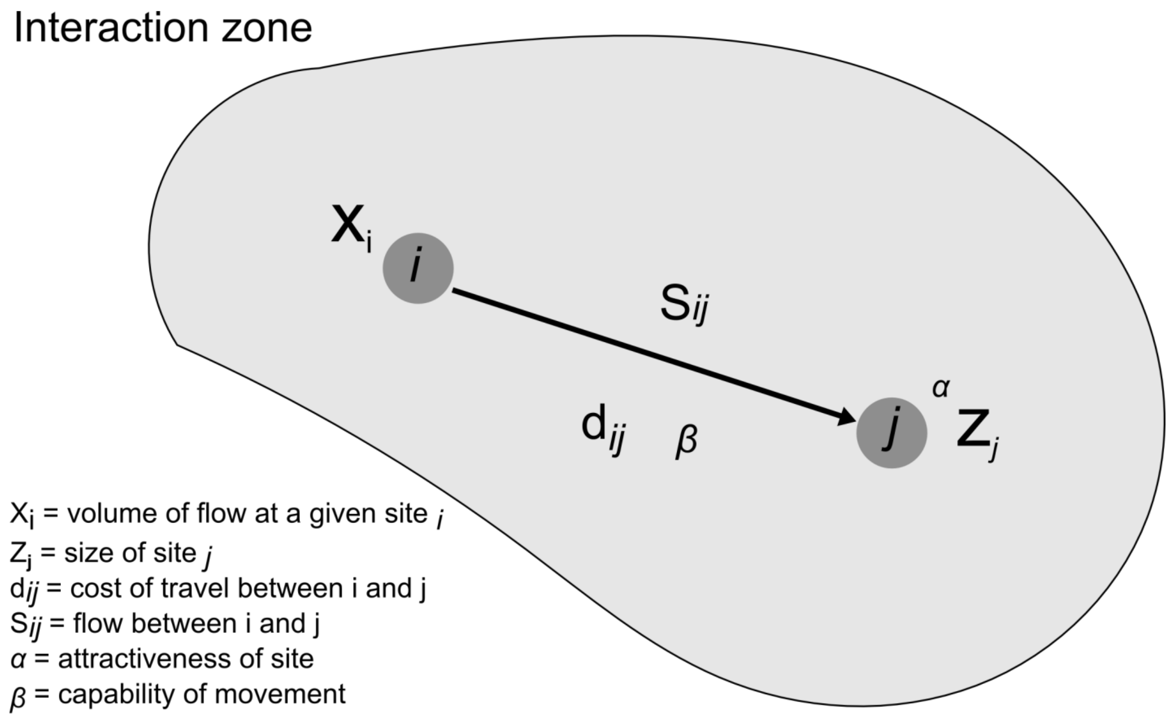

Figure 133. The variables of a spatial interaction model.

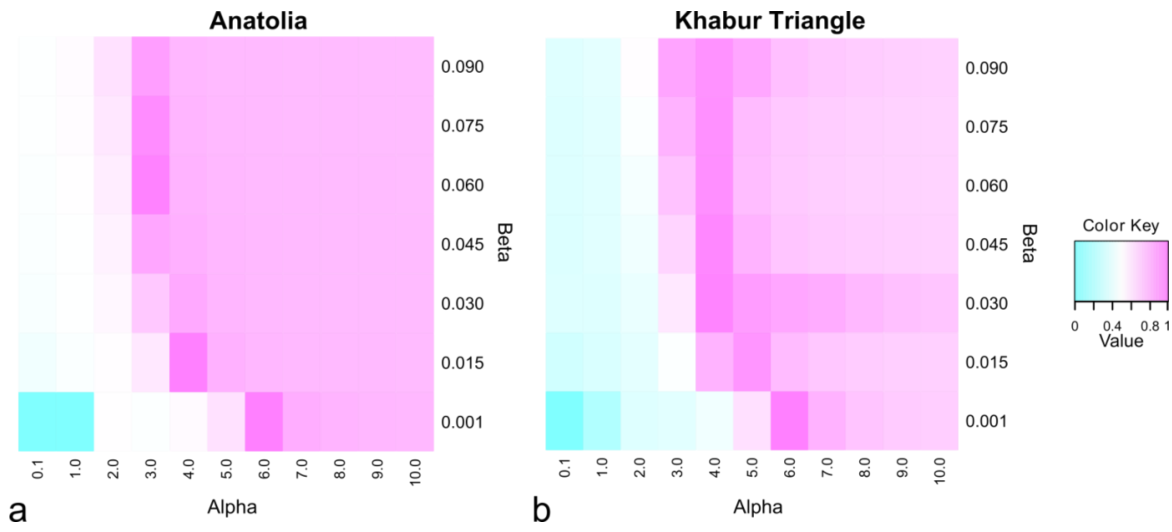

Figure 134. Heat map showing Pearson r^2's correlation in central Anatolia (a) and in the Khabur Triangle (b) under different α and β conditions. The colour represents correlation's values, with purple representing the best fit and blue the worst.

Region	**Attractiveness *(α)***	**Travel *(β)***	**Pearson r^2's correlation**
Central Anatolia	6.1	0.001	0.94
Khabur Triangle	6.1	0.002	0.99

Figure 135. Parameter values giving the highest Paerson r^2's correlation when compared with observed data.

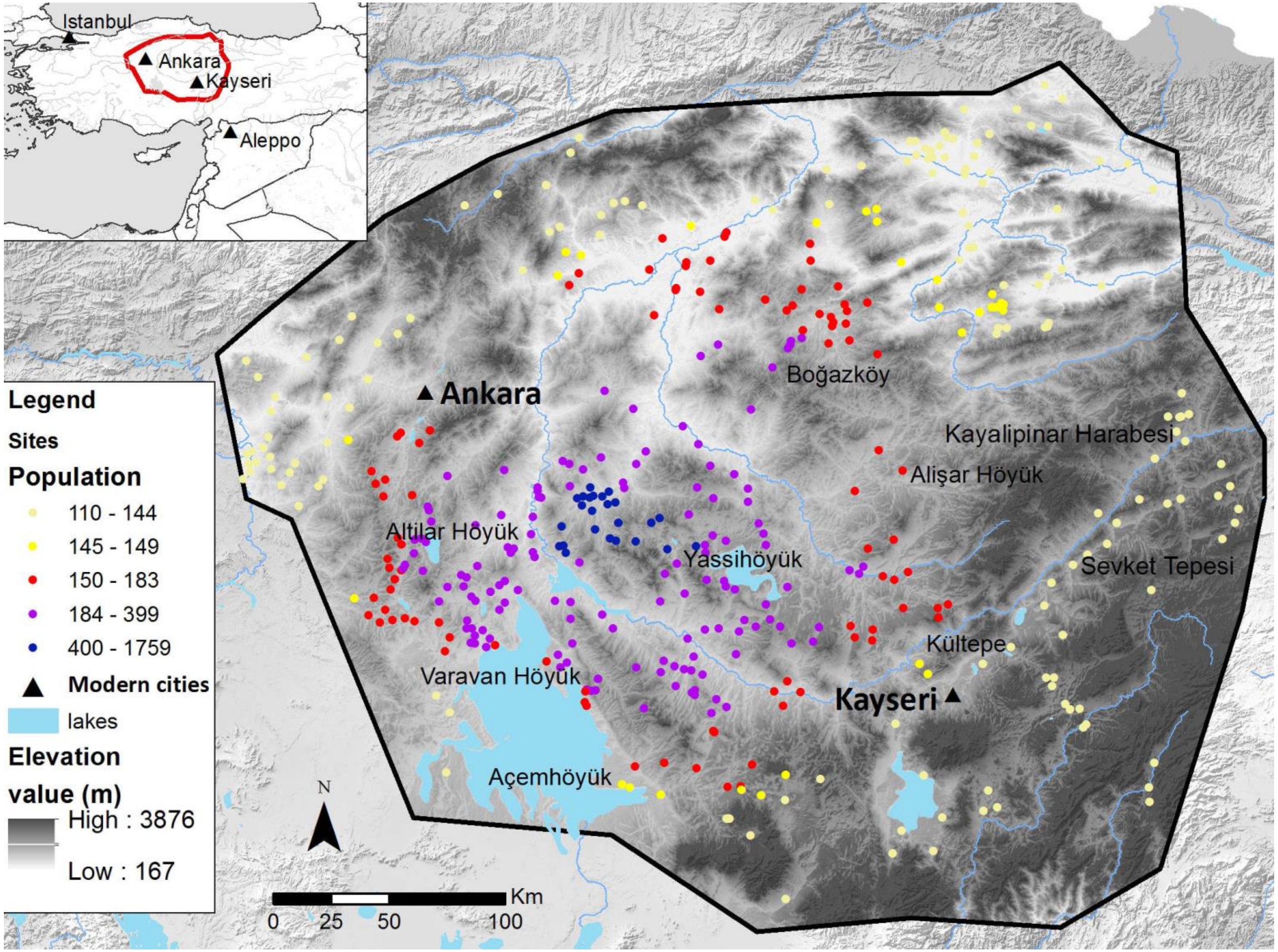

Figure 136. Mapped output from scenario 1 for central Anatolia, with parameter settings as indicated in Fig. 135. Blue indicates larger relative site size under the model.

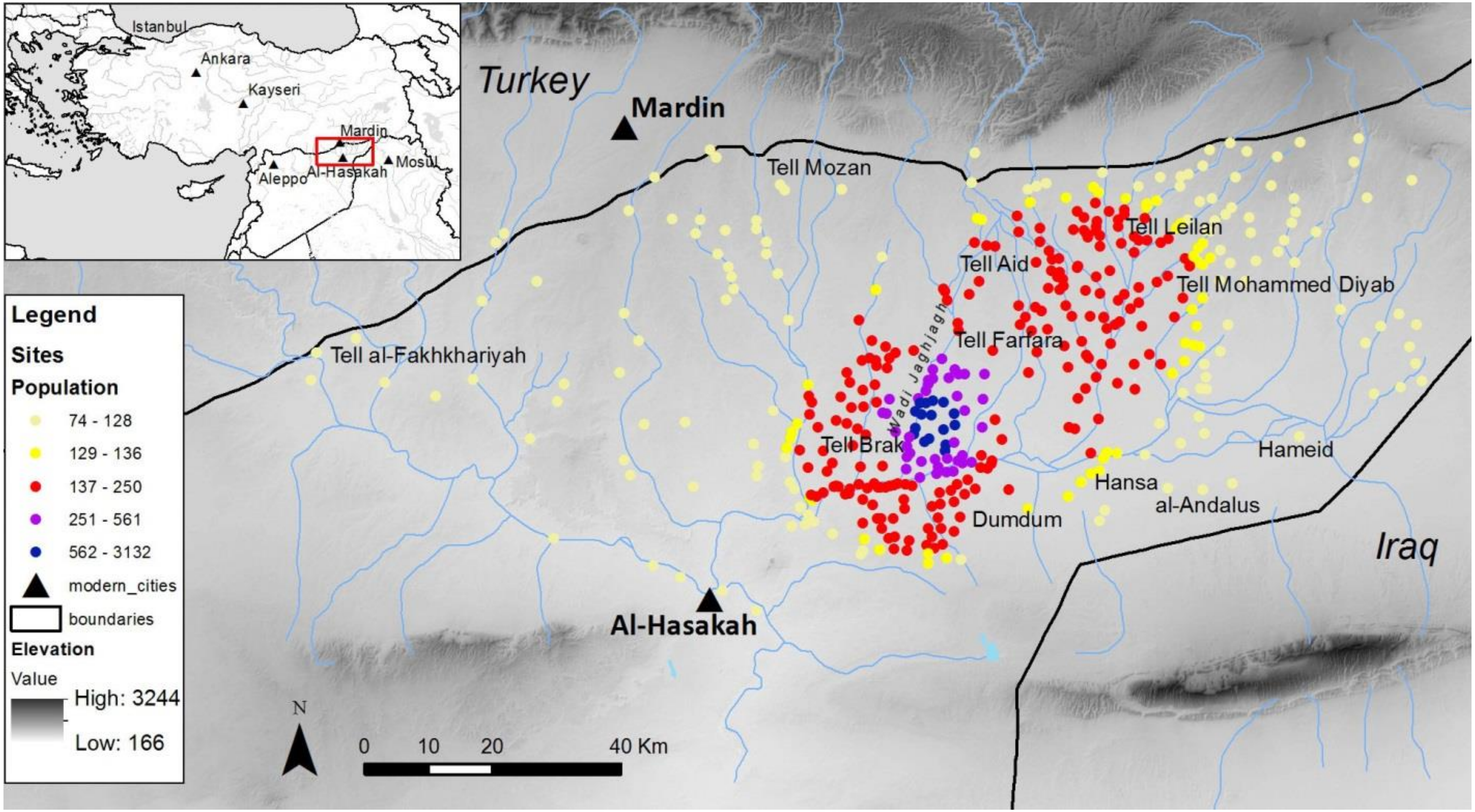

Figure 137. Mapped output from scenario 1 for the Khabur Triangle, with parameter settings as indicated in Fig. 135. Blue indicates larger relative site size under the model.

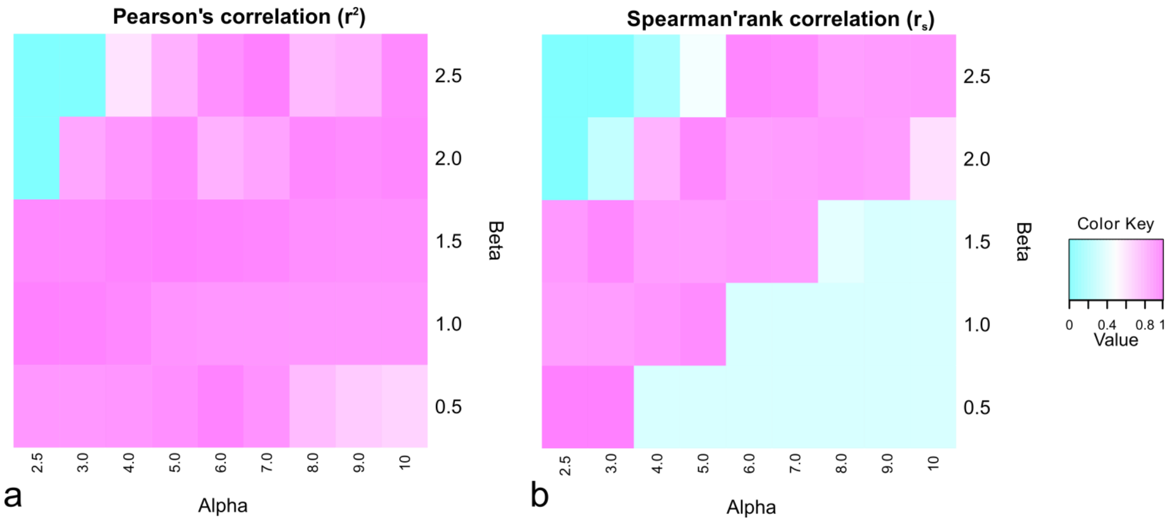

Figure 138. Heat map showing Pearson r^2's correlation (a), and Spearman's rank correlation (b) in central Anatolia under different α and β conditions. The colour represents correlation's values, with purple representing the best fit and blue the worst.

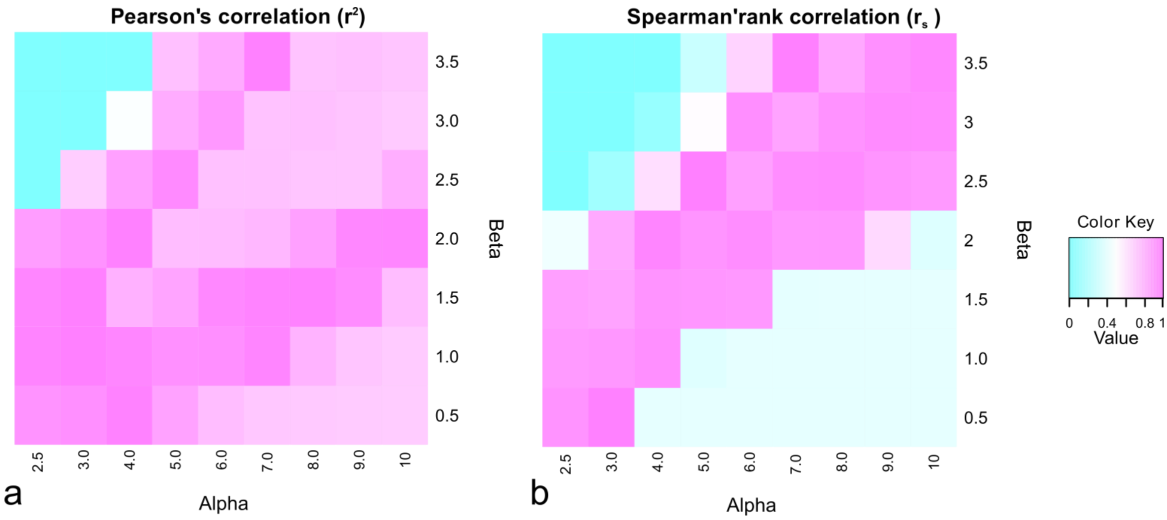

Figure 139. Heat map showing Pearson r^2's correlation (a), and Spearman's rank correlation (b) in the Khabur Triangle under different α and β conditions. The colour represents correlation's values, with purple representing the best fit and blue the worst.

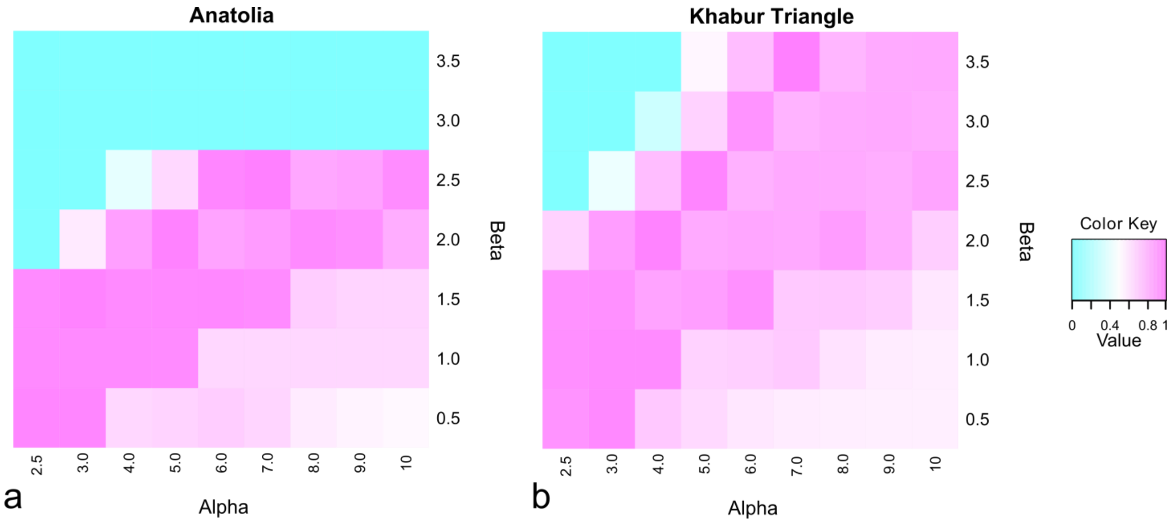

Figure 140. Heat map showing Pearson and Spearman's correlations averaged in central Anatolia (a) and in the Khabur Triangle (b) under different α and β conditions. The colour represents correlation's values, with purple representing the best fit and blue the worst.

Region	**Attractiveness *(α)***	**Travel *(β)***	**Pearson r^2's correlation**	**Spearman's rank correlation**
Central Anatolia	7.0	2.5	0.93	0.83
Khabur Triangle	7.3	3.3	0.93	0.83

Figure 141. Parameter values giving the highest combination in terms of Paerson r^2's correlation and Spearman's rank correlation when compared with observed data.

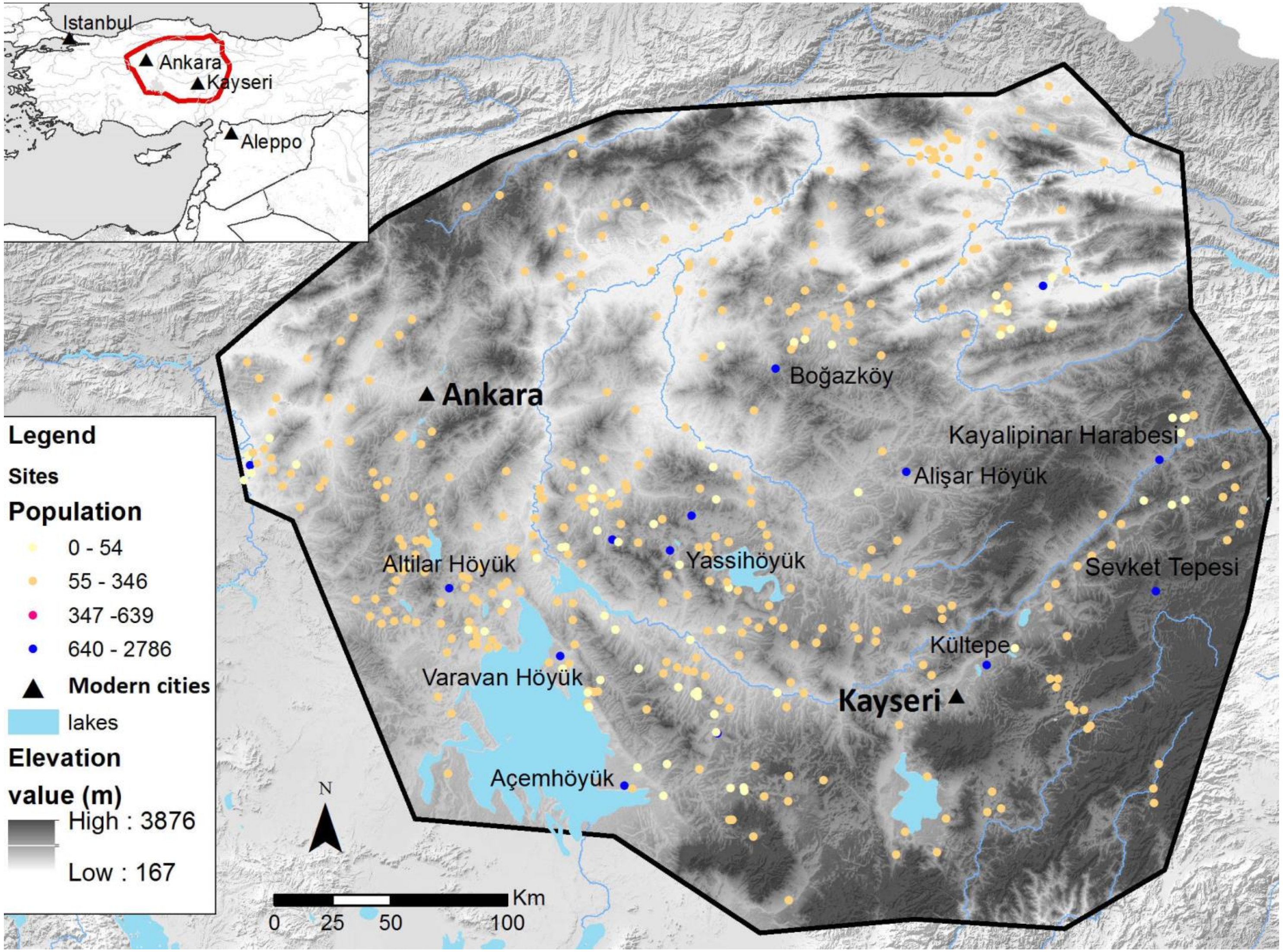

Figure 142. Mapped output from scenario 2 for central Anatolia, with parameter settings as indicated in Fig. 141. Blue indicates larger relative site size under the model.

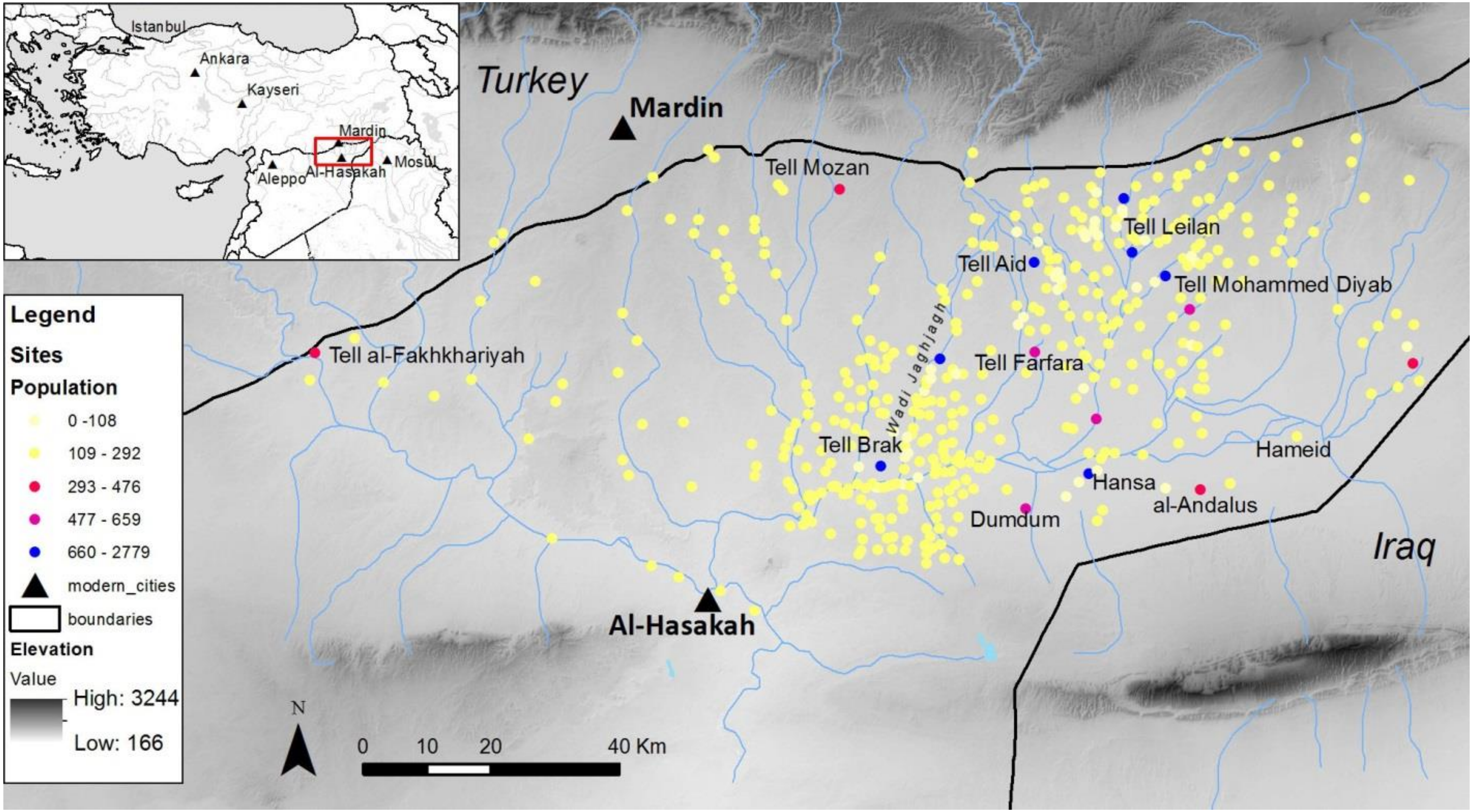

Figure 143. Mapped output from scenario 2 for the Khabur Triangle, with parameter settings as indicated in Fig. 141. Blue indicates larger relative site size under the model.

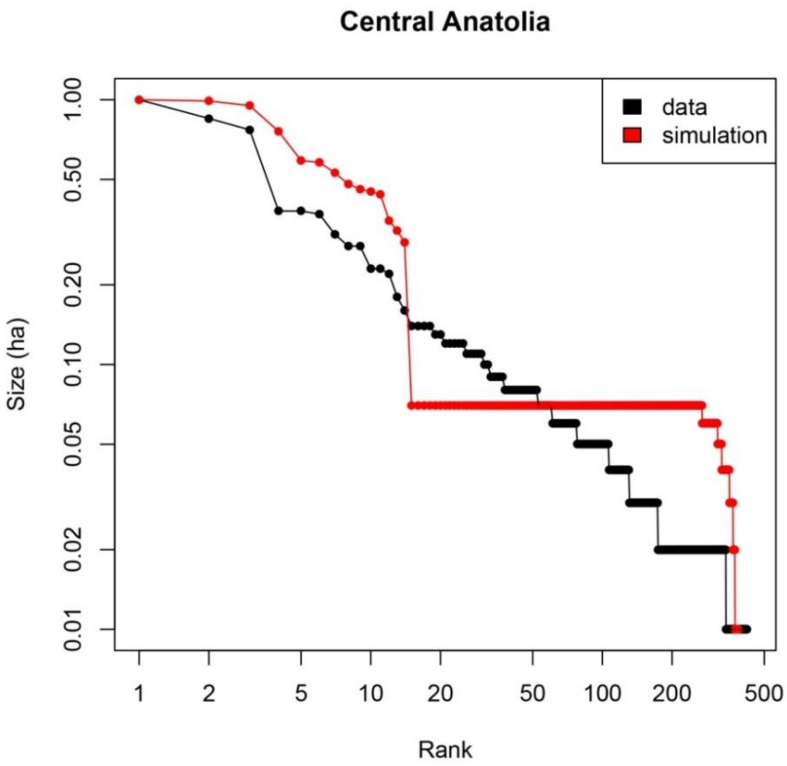

Figure 144. Comparison of site size hierarchies on normalised logarithmic scale (using population and estimated size) between the modelled and the observed data in central Anatolia.

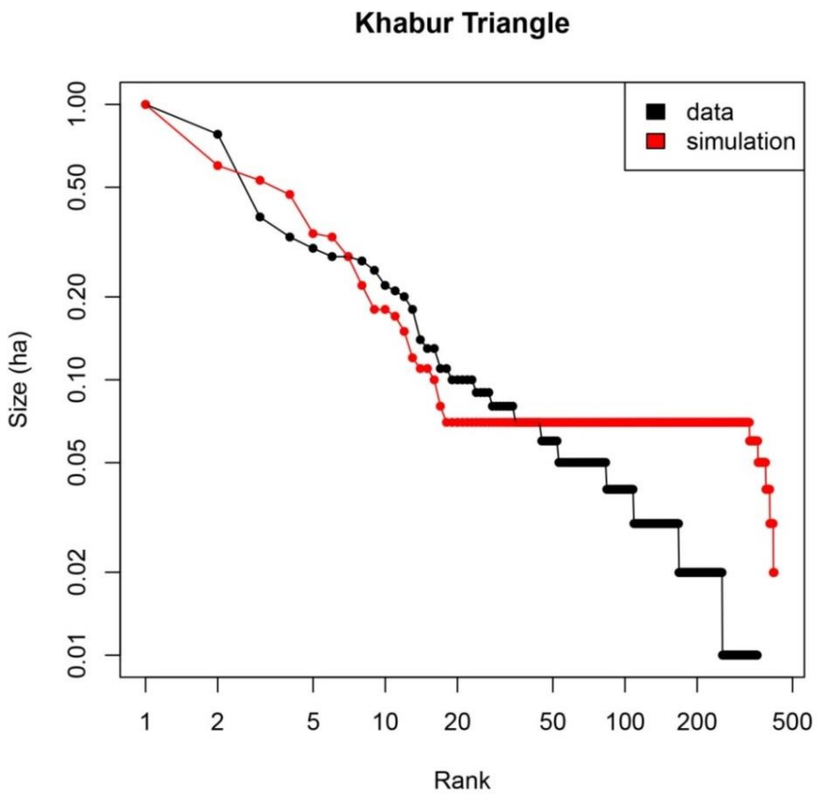

Figure 145. Comparison of site size hierarchies on normalised logarithmic scale (using population and estimated size) between the modelled and the observed data in the Khabur Triangle.

Region	Probability of removing sites	n. of sites	Pearson r^2's correlation	Spearman's rank correlation	Attractiveness (α)	Travel (β)
Central Anatolia	0	440	0.93	0.83	7.0	2.5
	0.05	418	0.93	0.81		
	0.15	374	0.92	0.81		
	0.25	330	0.91	0.81		
	0.5	220	0.89	0.83		
Khabur Triangle	0	439	0.83	0.93	7.3	3.3
	0.05	417	0.83	0.93		
	0.15	373	0.83	0.93		
	0.25	329	0.83	0.93		
	0.5	219	0.83	0.93		

Figure 146. Table showing Pearson and Spearman's correlations under different probability settings of an averaging and random sampling system.

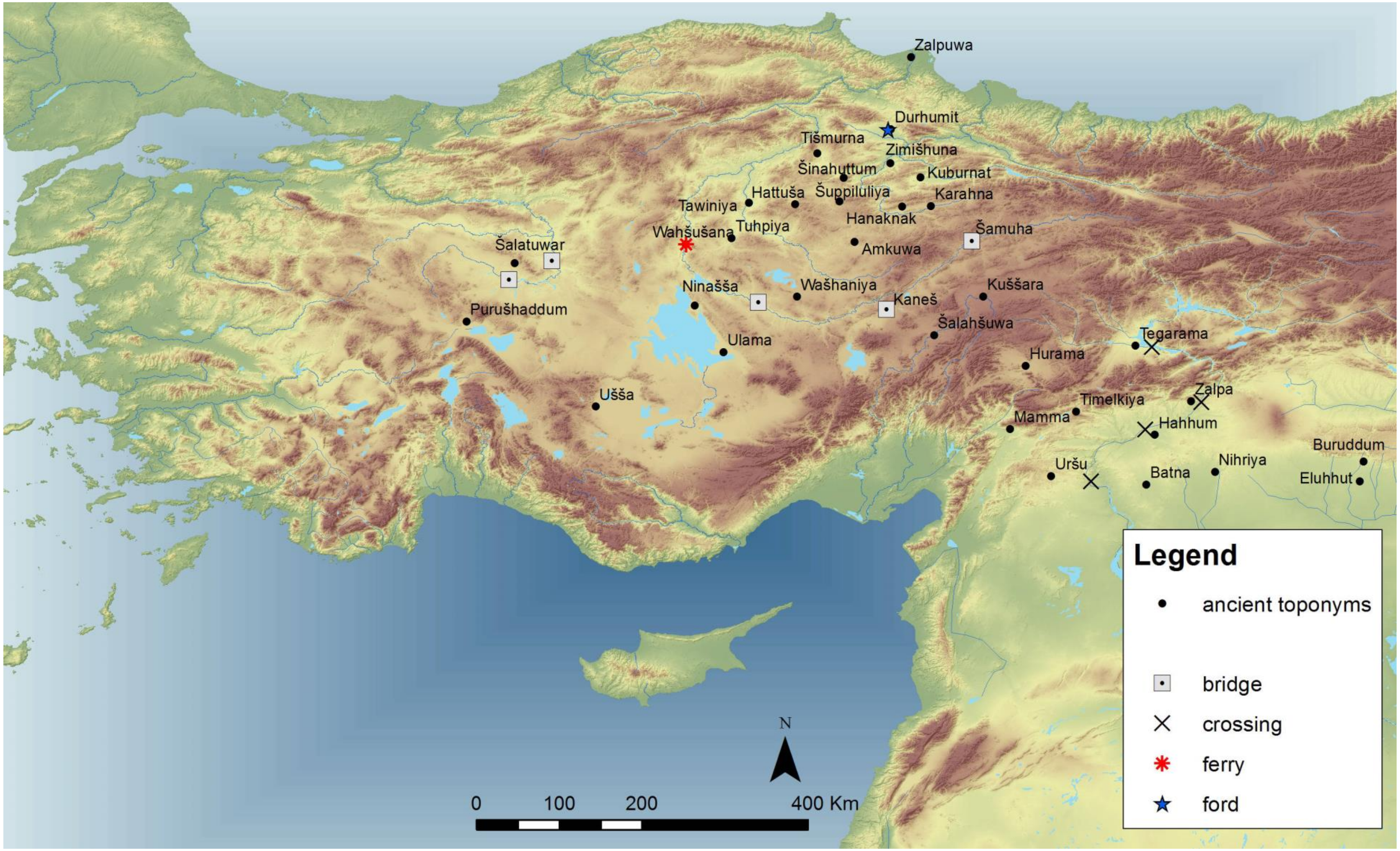

Figure 147. Locations of bridges, fords, ferries and crossings in Anatolia during the Old Assyrian Period (Source: Barjamovic 2011a, table 2).

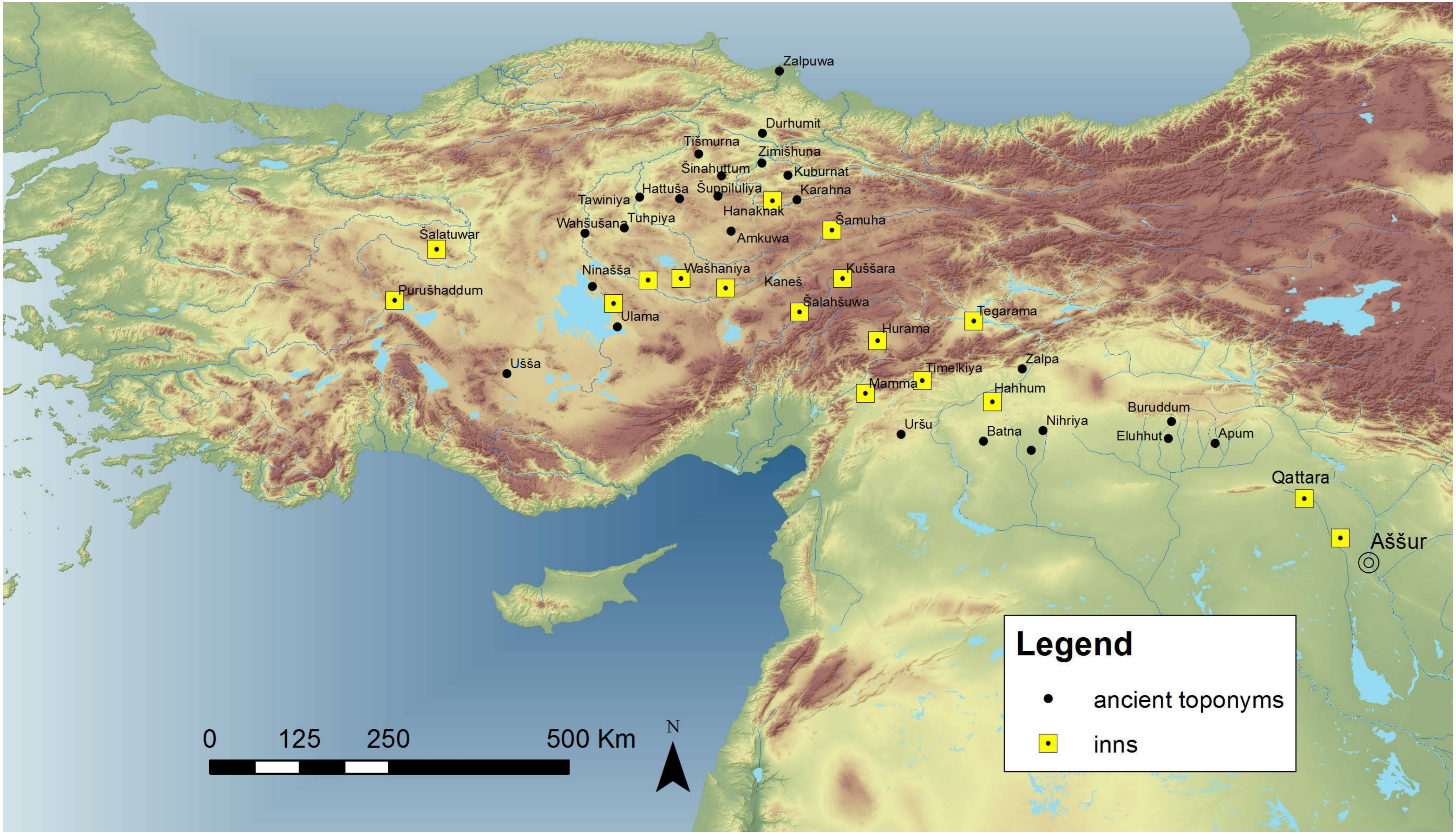

Figure 148. Locations of inns in Anatolia during the Old Assyrian Period (Source: Barjamovic 2011a, table 5).

Figure 149. Flooded hollow ways to the north of Tell Brak after heavy precipitations. (Picture taken from the author on the 1st of May 2011).

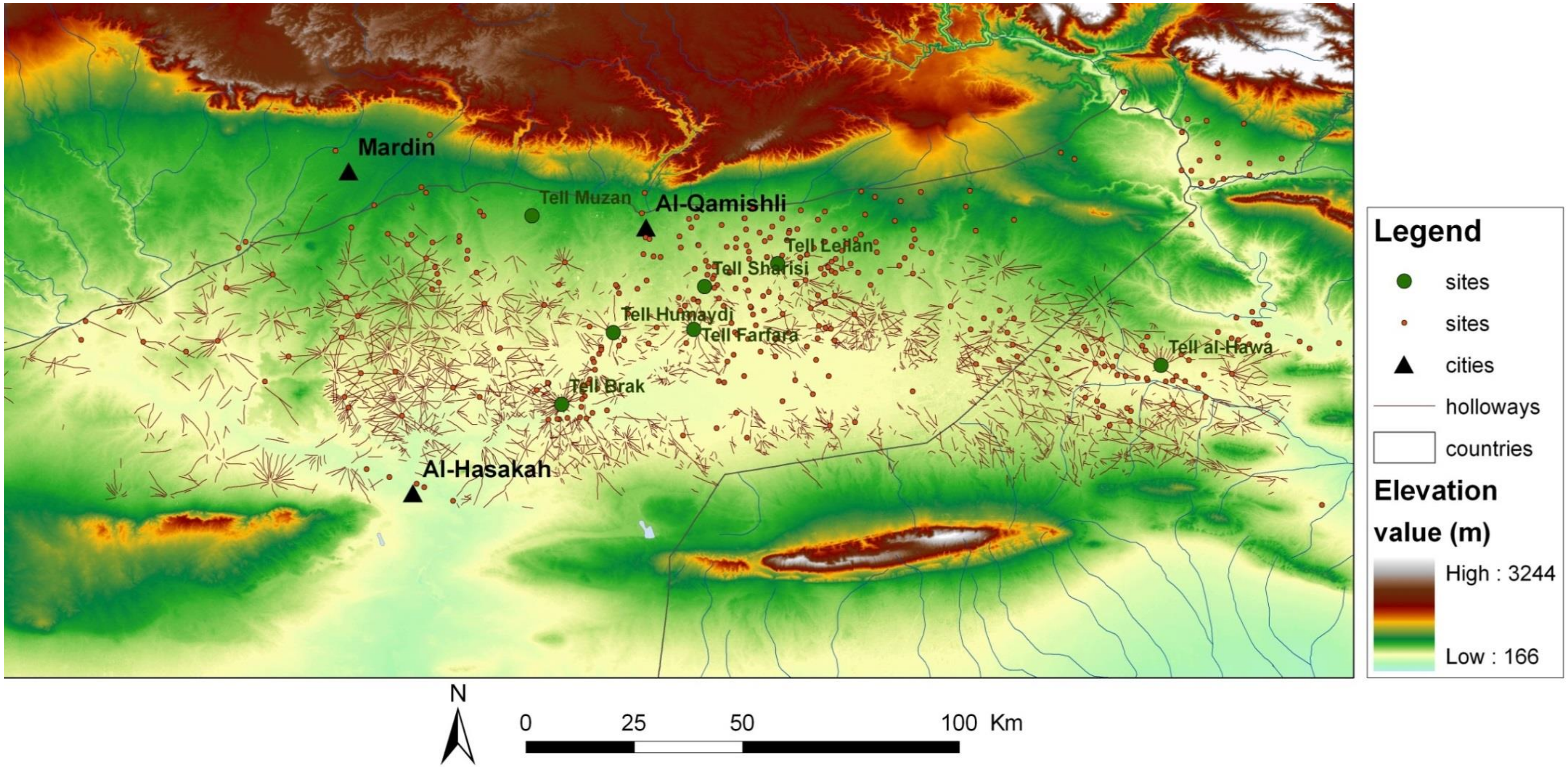

Figure 150. Network of hollow ways in the Khabur Triangle (Source: Ur 2010b).

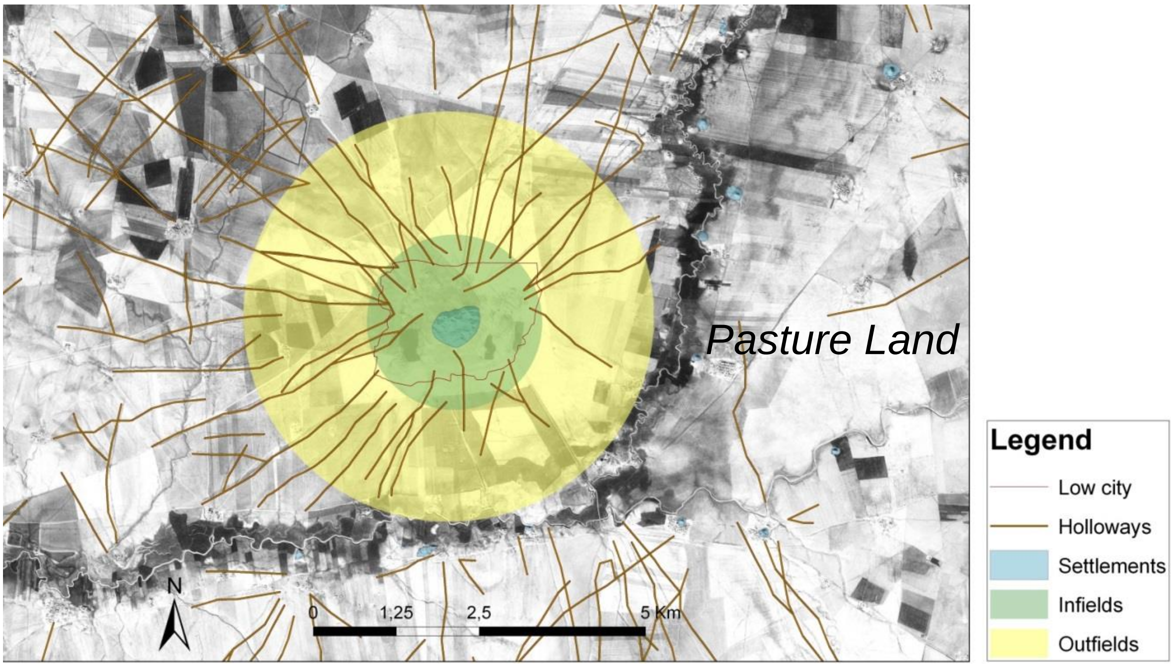

Figure 151. Schematic plan of settlement, roadways, and land-use zones at Tell Brak.

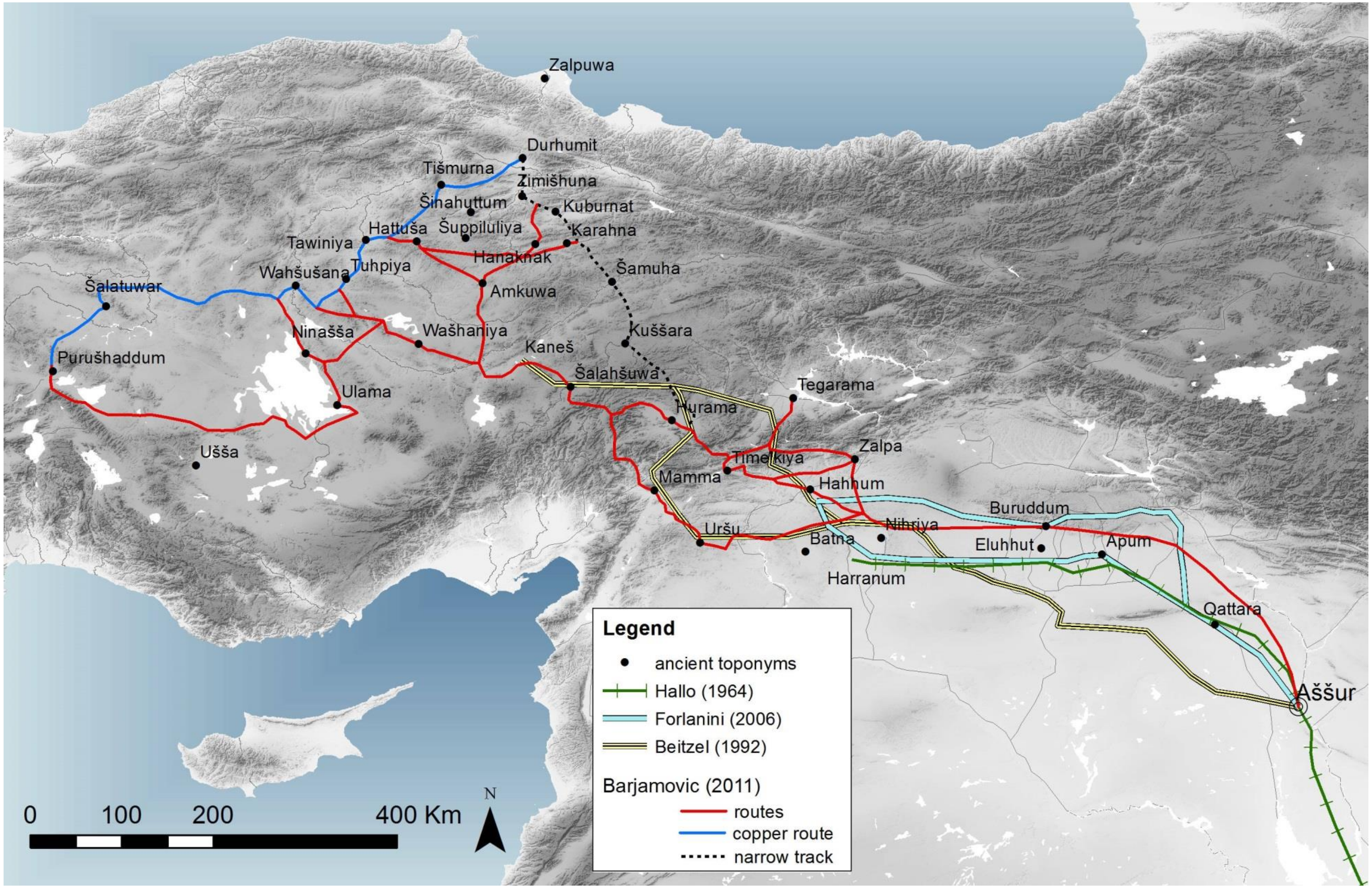

Figure 152. Trade routes in the Old Assyrian Period.

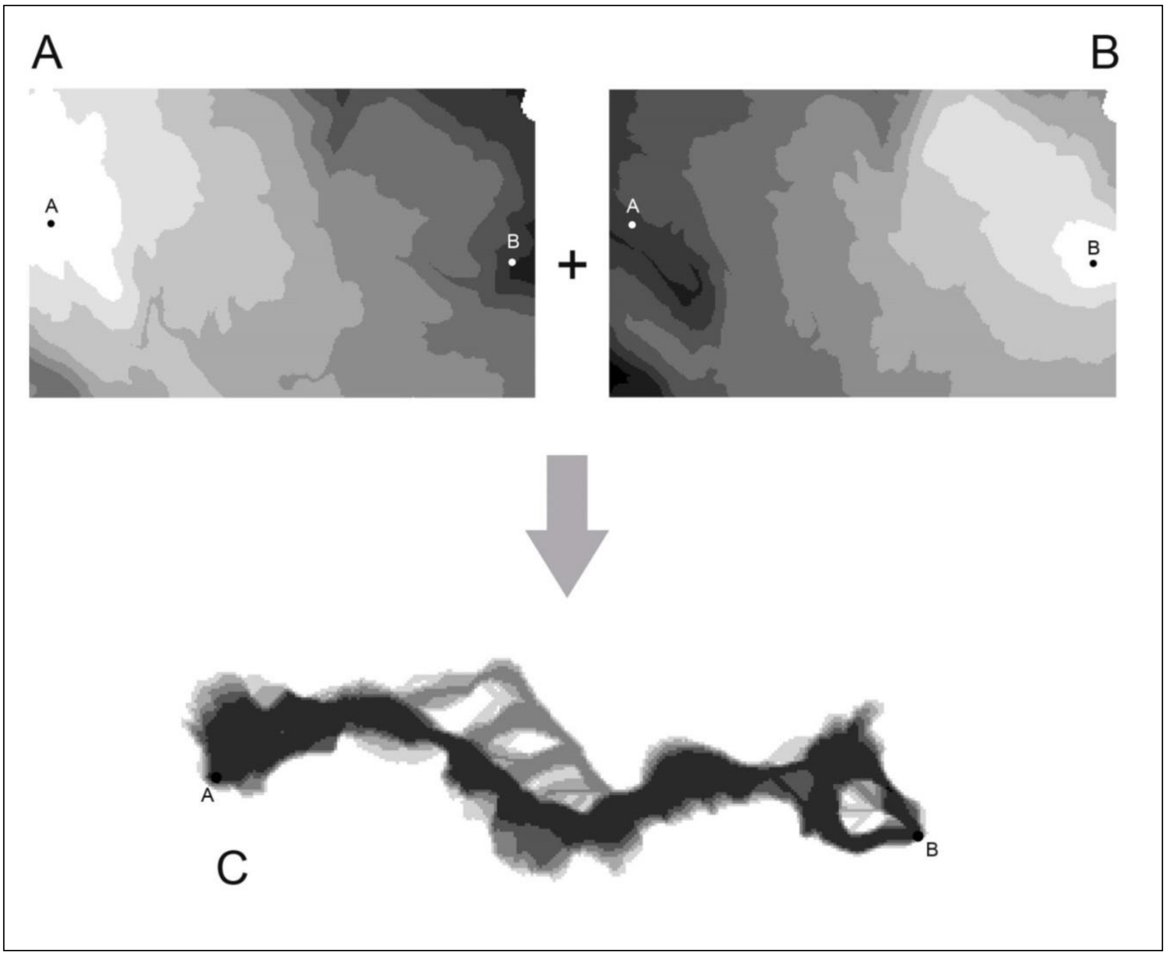

Figure 153. Illustration of the procedure for generating a CMTC grid. A - B. Cumulative cost surfaces from point A (left) and point B (right). Lighter shades indicate lower cumulative movement cost. C. Corridor created by adding the two grids A and B. The darker shades indicate the optimum corridor.

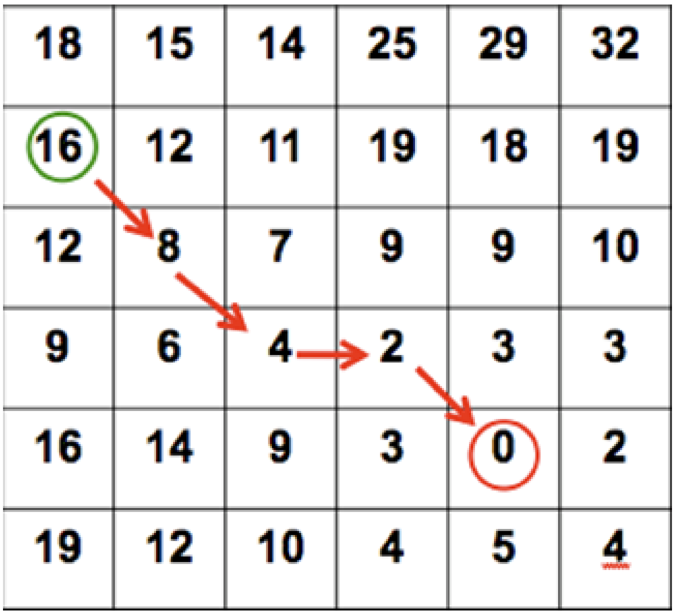

Figure 154. Example of least-cost path generated from an accumulated cost surface map.

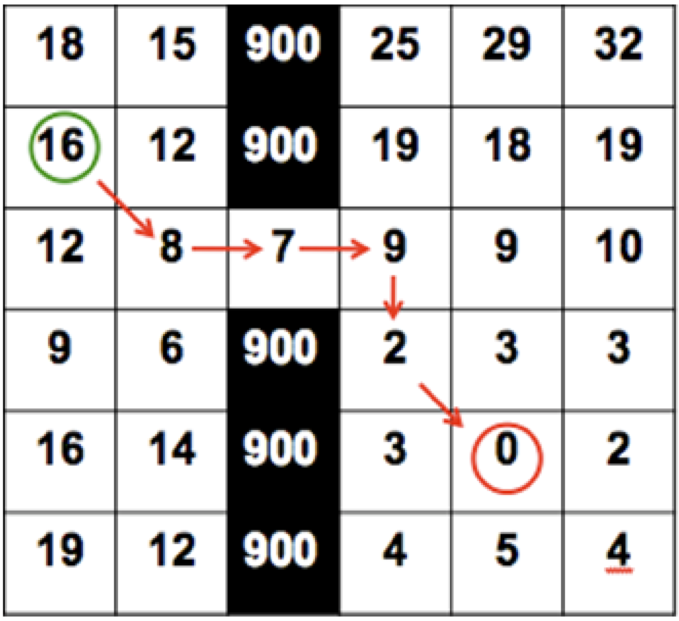

Figure 155. Representation (black pixels) of linear terrain features (e.g. Rivers, defensive walls, territorial boundaries, etc.) in a raster friction surface.

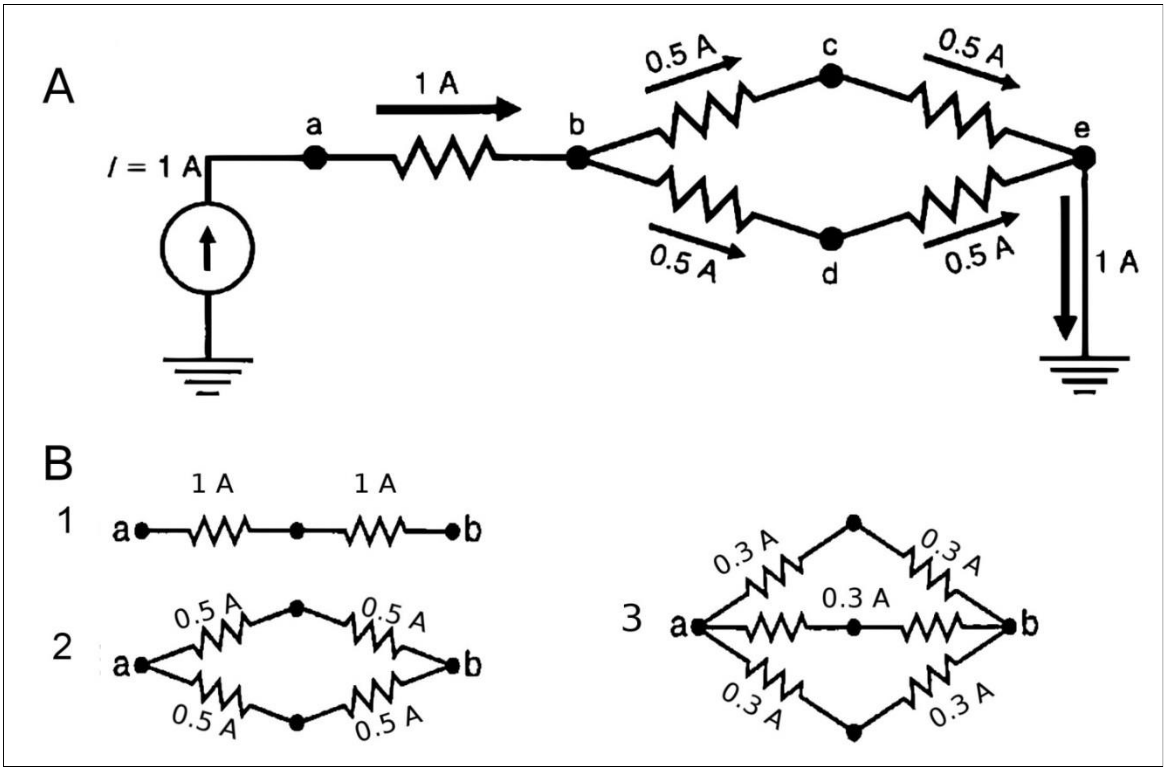

Figure 156. A simple circuit, with a 1-A (ampere) current source (I) placed at node *a*, and with node *e* tied to ground. The amount of current through resistors reflect the probability that a random walker, starting at node a, is expected to pass along each branch before reaching node e. B(1-3). Three graphs with resistors connecting node *a* and *b*. (Figure modified from McRae *et al.* 2008).

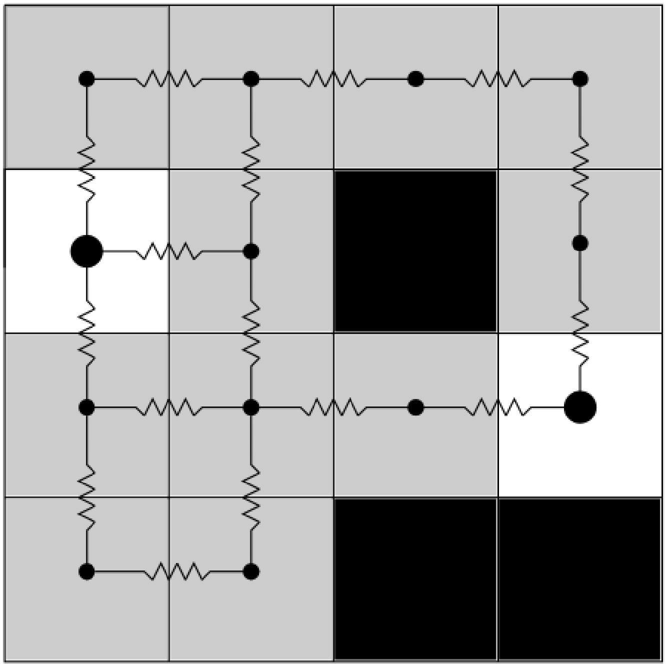

Figure 157. An example of landscape represented as both a grid and a circuit. The landscape contains patches of 0-resistance cells (open), dispersal habitat of finite resistance (grey), and one ''barrier'' cell with infinite resistance (black). Cells with finite resistance are replaced with nodes (small dots), and adjacent nodes are connected by resistors (Modified from McRae *et al.* 2008).

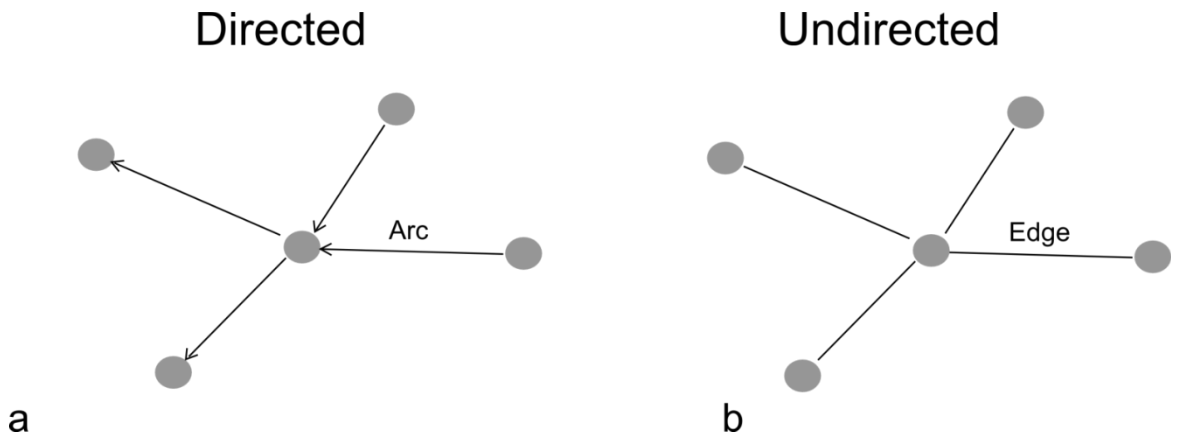

Figure 158. Examples of Directed (a) and Undirected (b) network.

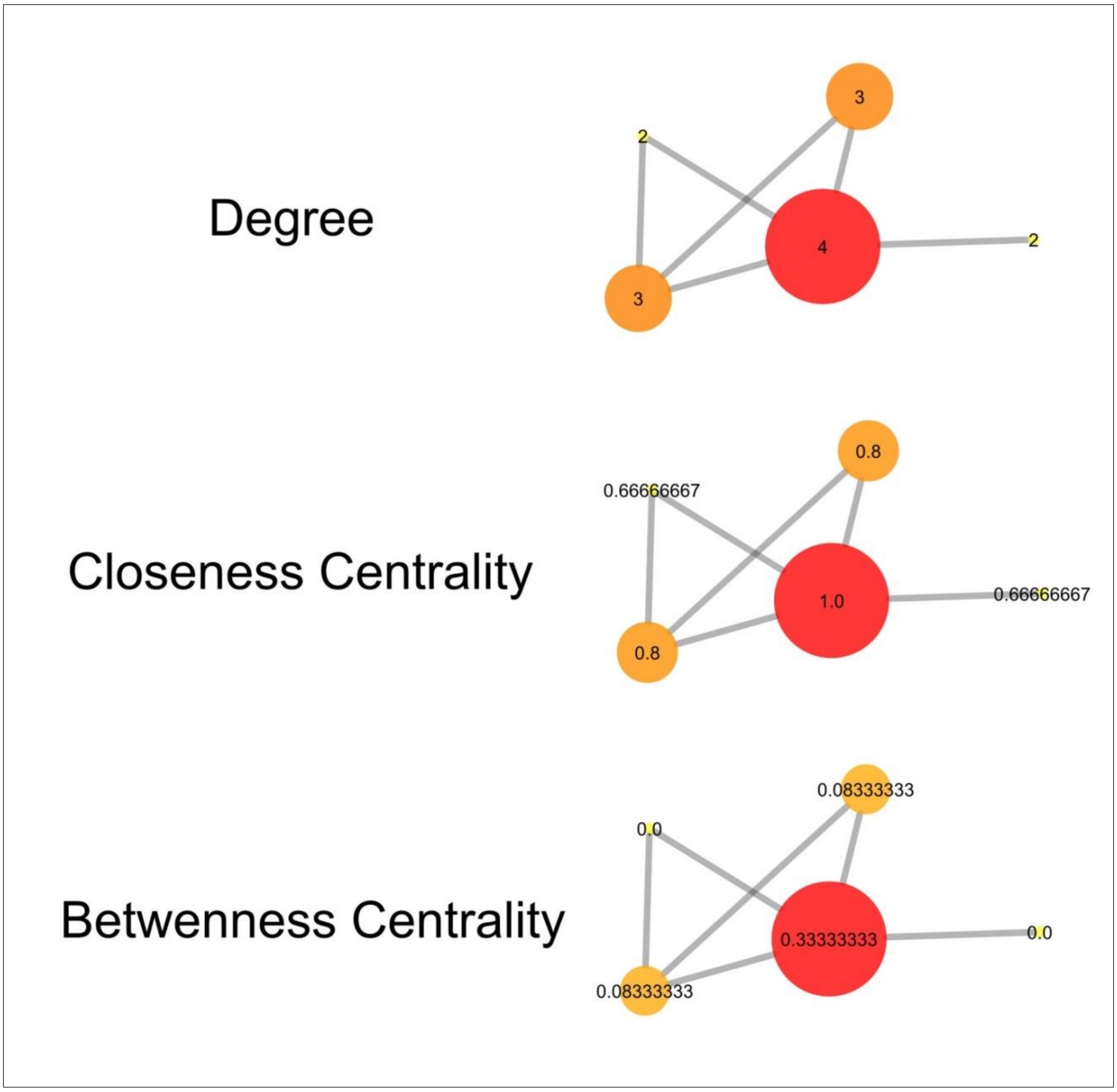

Figure 159. Examples of degree, closeness and betweenness centrality for three undirected network structures. Nodes size/colour and labels indicate centrality values.

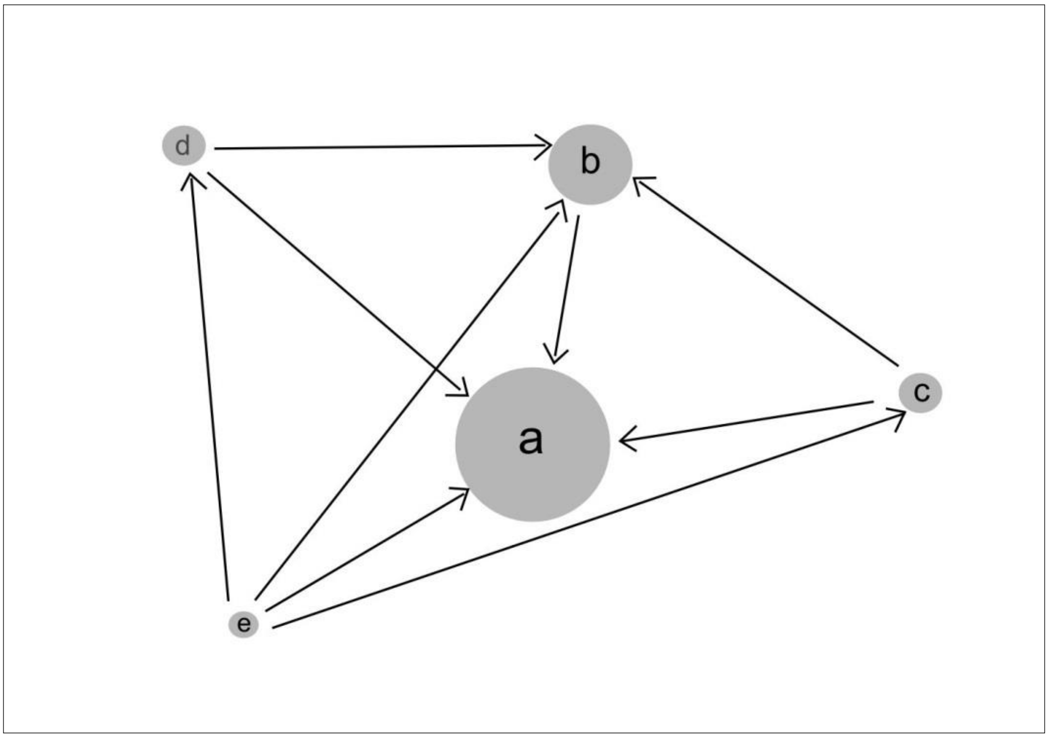

Figure 160. Example of hierarchical directed Nystuen-Dacey (N-D) network. The node *a* is the biggest one in the network and, therefore, it receives flow from all surrounding nodes. On the contrary, the node *e* is the smallest one and arcs from it depart towards all other nodes.

Arc value threshold	Min. arc value	Max. arc value	No. nodes	No. arcs	No. components
None	0.1e-05	1424	440	96,578	1
1	> 1	1424	440	2,318	1
+ 1 std. dev.	> 57	1424	240	298	2

Figure 161. Nystuen-Dacey graph structure in central Anatolia according to the arc value threshold.

Arc value threshold	Min. arc value	Max. arc value	No. nodes	No. arcs	No. components
None	0.1e-05	456	439	96,141	1
1	> 1	456	173	532	2
+ 1 std. dev.	> 14	456	120	135	5

Figure 162. Nystuen-Dacey graph structure in the Khabur Triangle according to the arc value threshold.

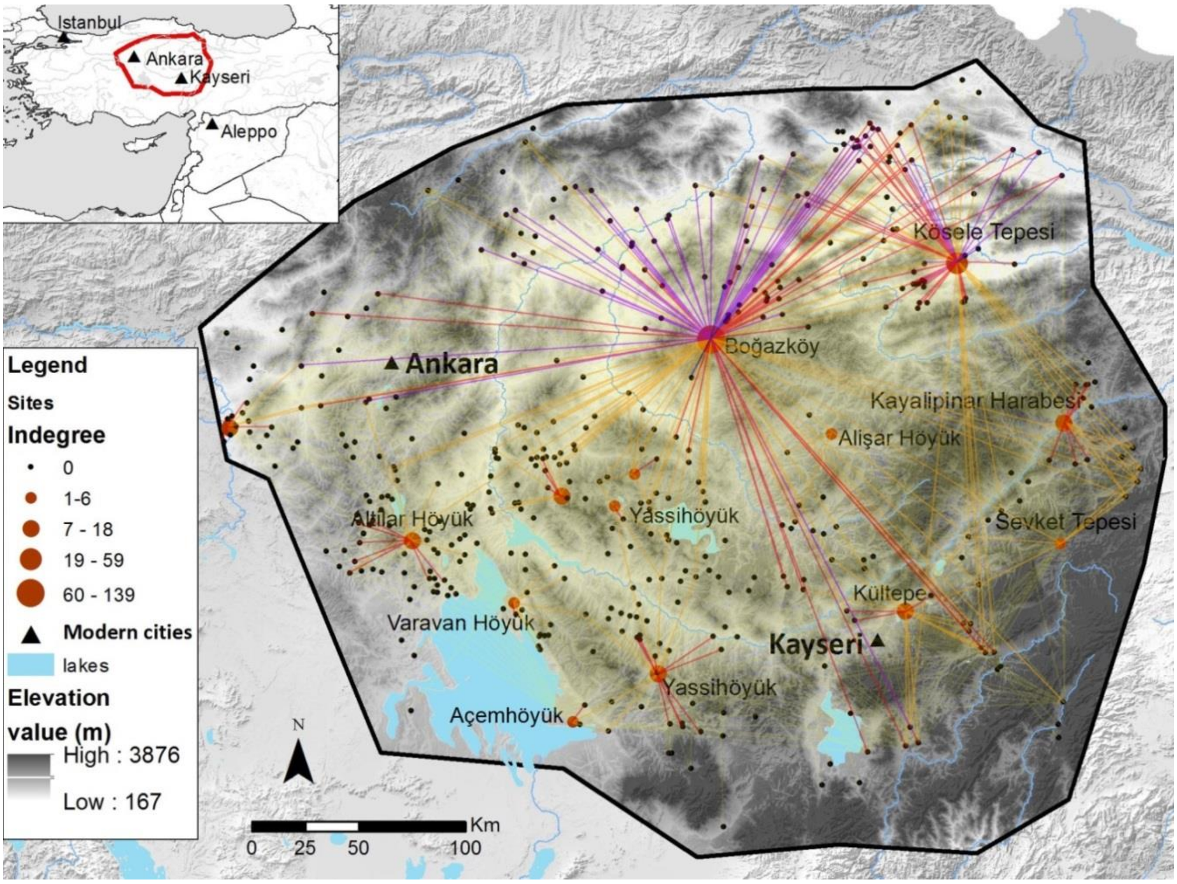

Figure 163. Indegree values of settlements in central Anatolia. The arcs are coloured according to flow, ranging from yellow to blue.

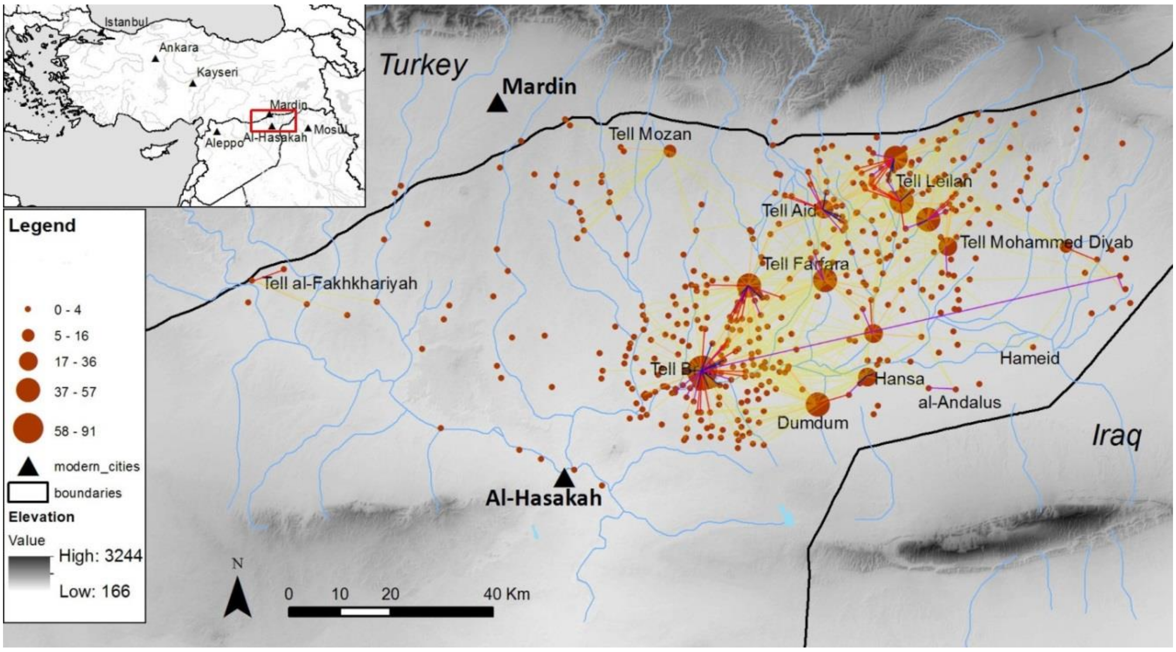

Figure 164. Indegree values of settlements in the Khabur Triangle. The arcs are coloured according to flow, ranging from yellow to blue.

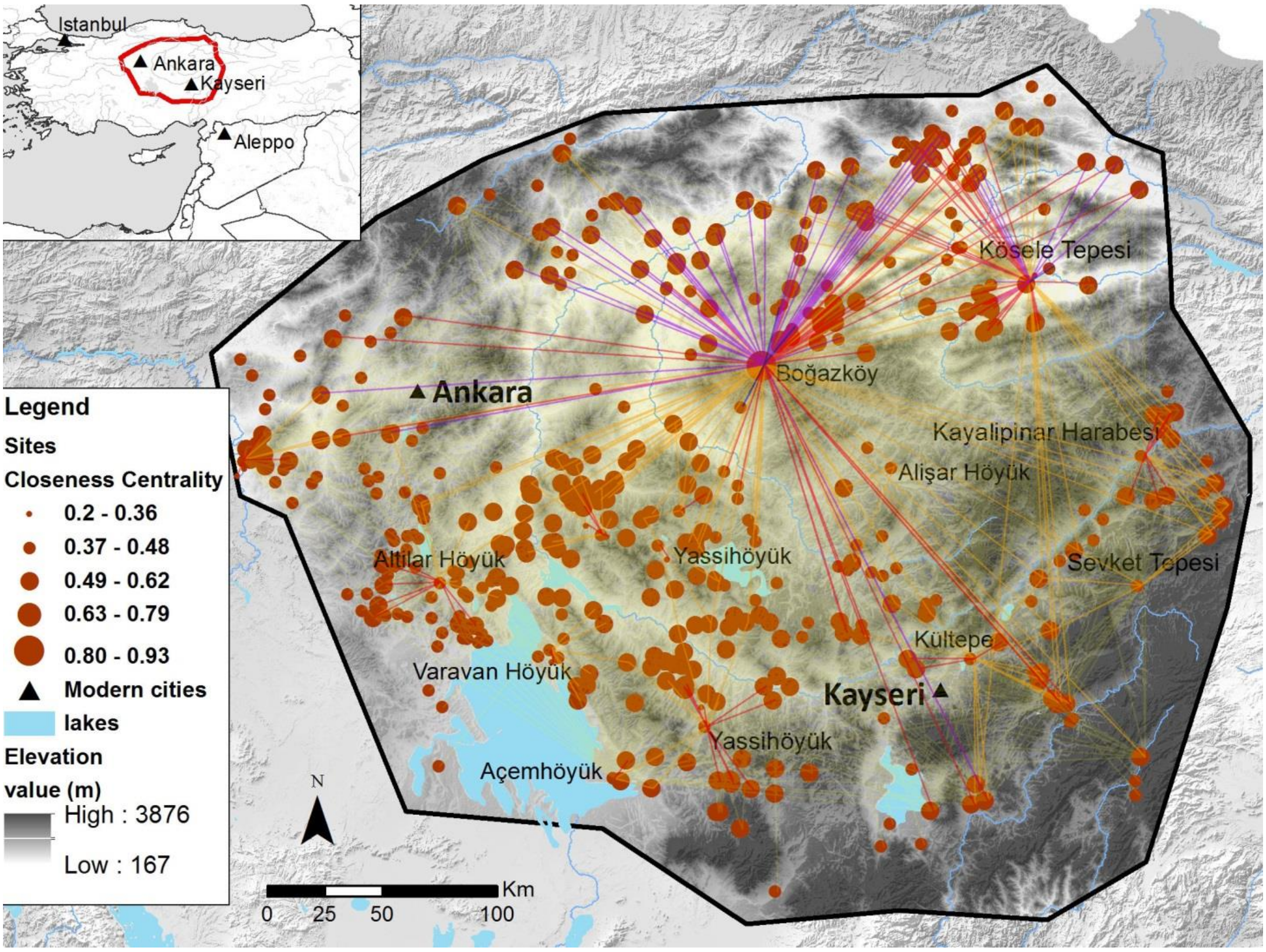

Figure 165. Closeness Centrality values of settlements in central Anatolia. The edges are coloured according to flow, ranging from yellow to blue.

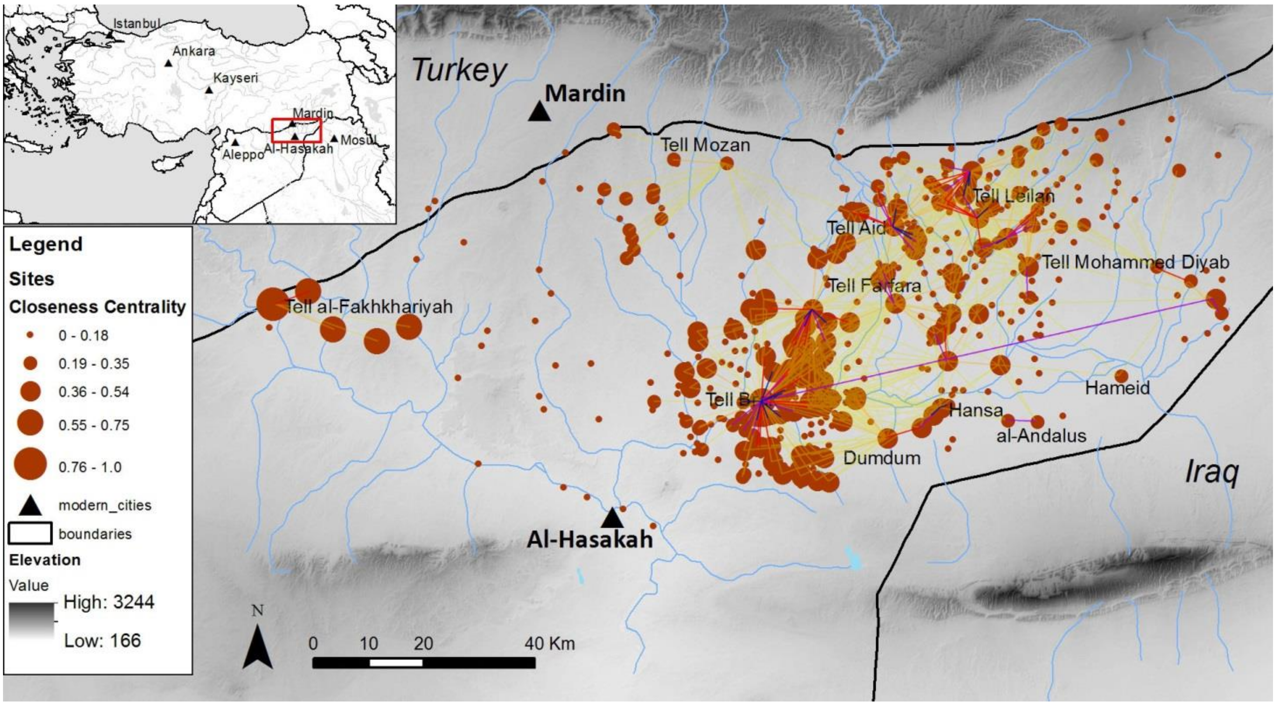

Figure 166. Closeness Centrality values of settlements in the Khabur Triangle. The edges are coloured according to flow, ranging from yellow to blue.

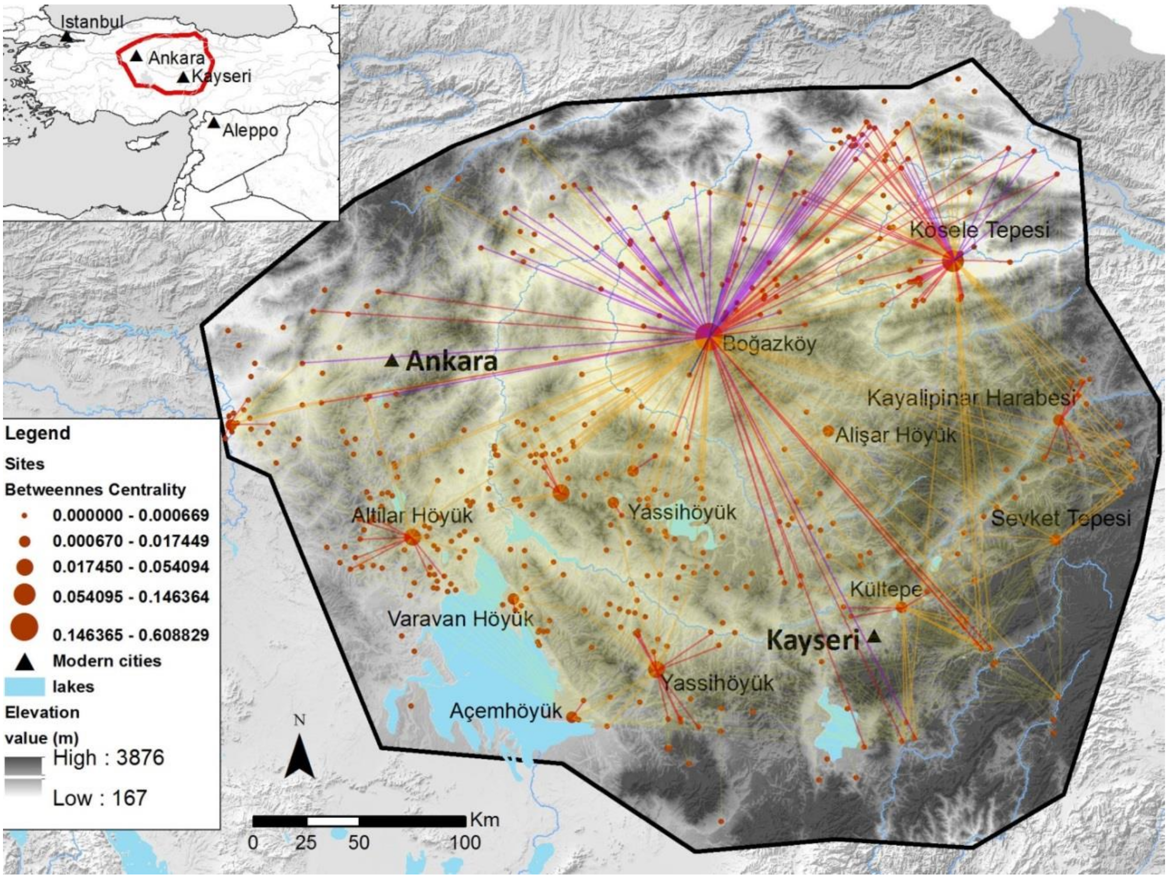

Figure 167. Betweenness Centrality values of settlements in central Anatolia. The edges are coloured according to flow, ranging from yellow to blue.

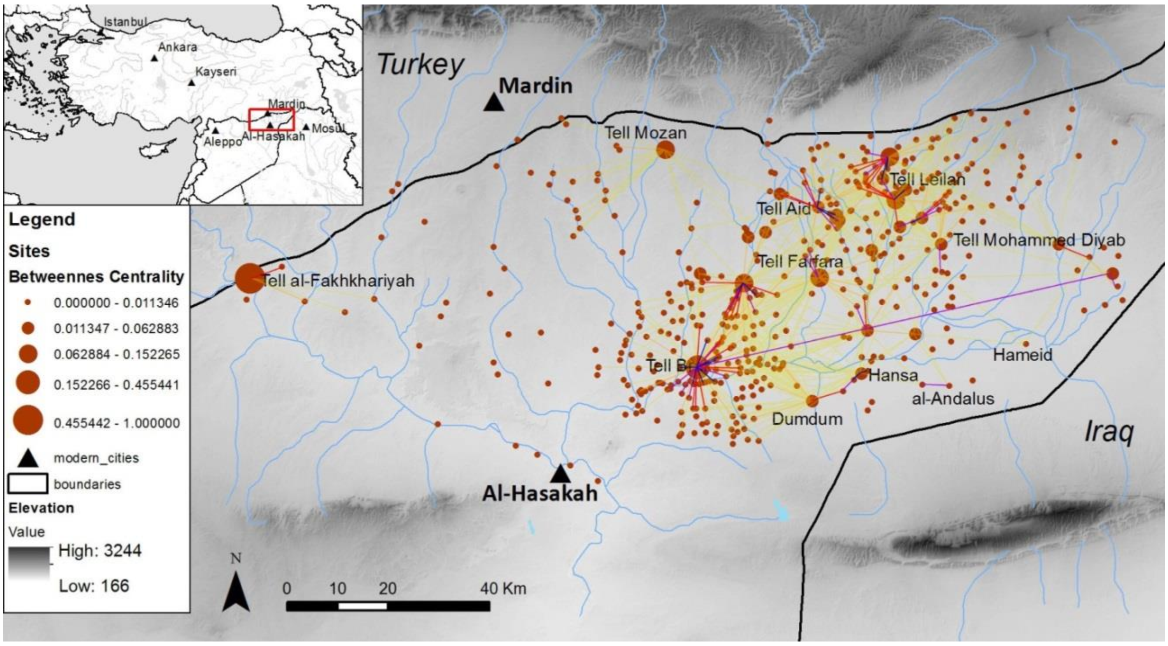

Figure 168. Betweenness Centrality values of settlements in the Khabur Triangle. The edges are coloured according to flow, ranging from yellow to blue.

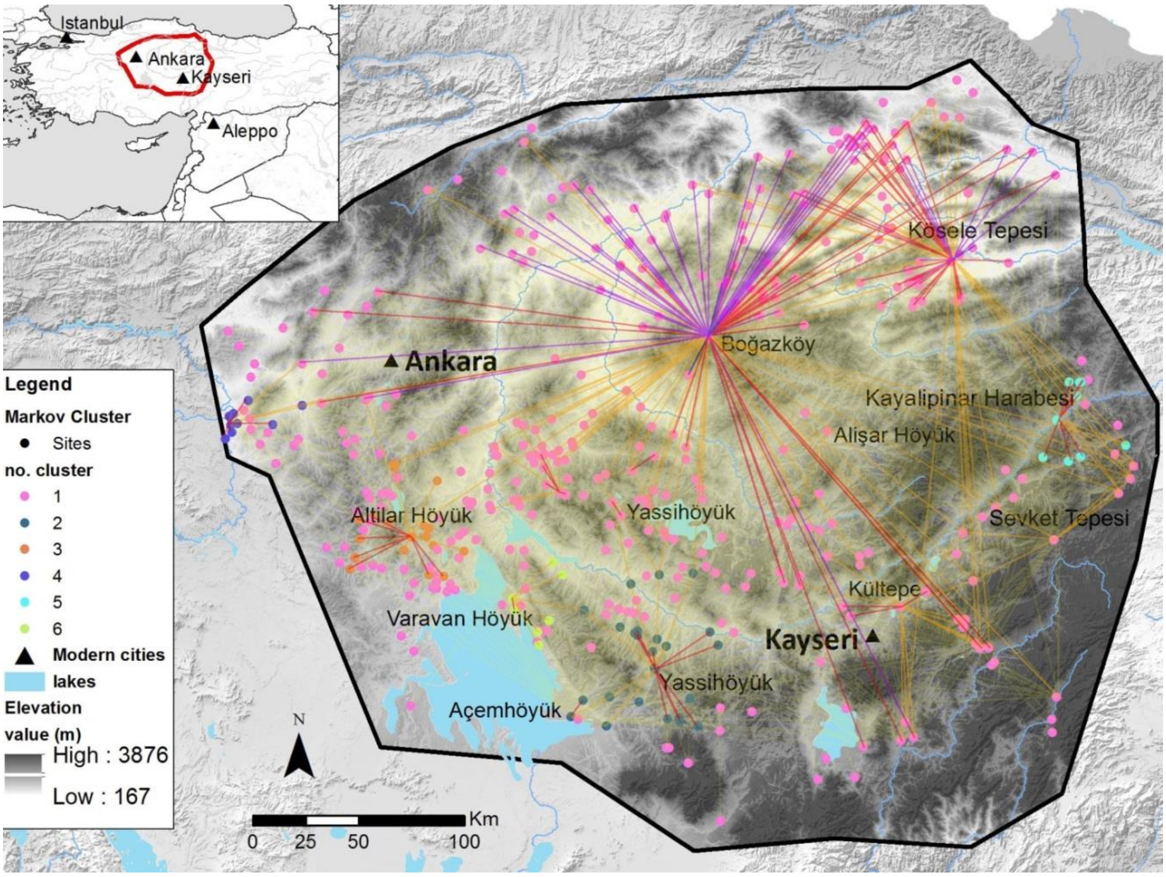

Figure 169. Markov cluster of settlements in central Anatolia. The arcs are coloured according to flow, ranging from yellow to blue.

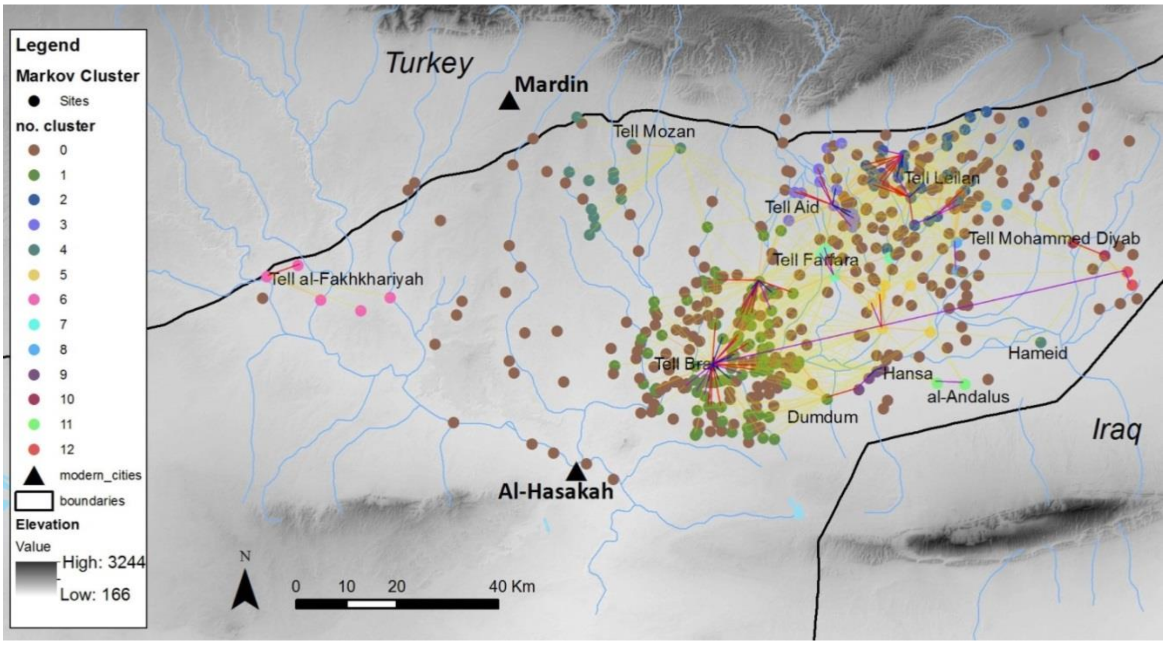

Figure 170. Markov cluster of settlements in the Khabur Triangle. The arcs are coloured according to flow, ranging from yellow to blue.

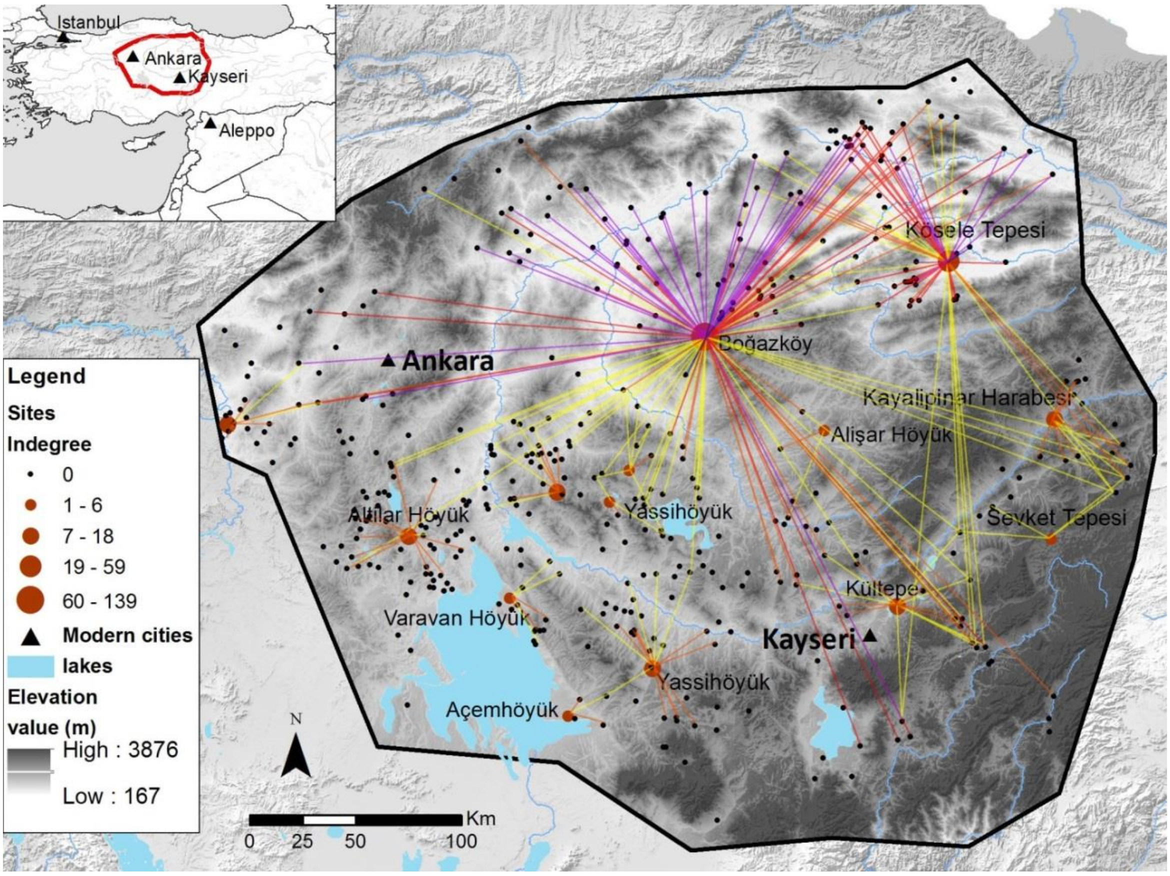

Figure 171. Indegree values of settlements in central Anatolia. The arcs are coloured according to flow, ranging from yellow to blue.

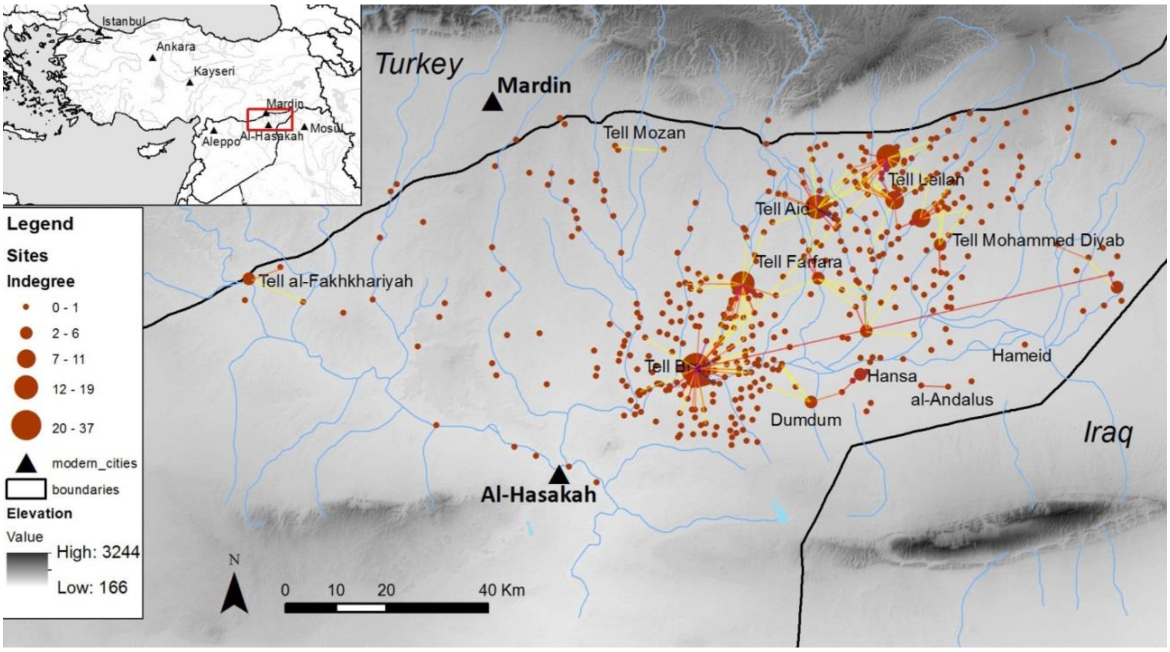

Figure 172. Indegree values of settlements in the Khabur Triangle. The arcs are coloured according to flow, ranging from yellow to blue.

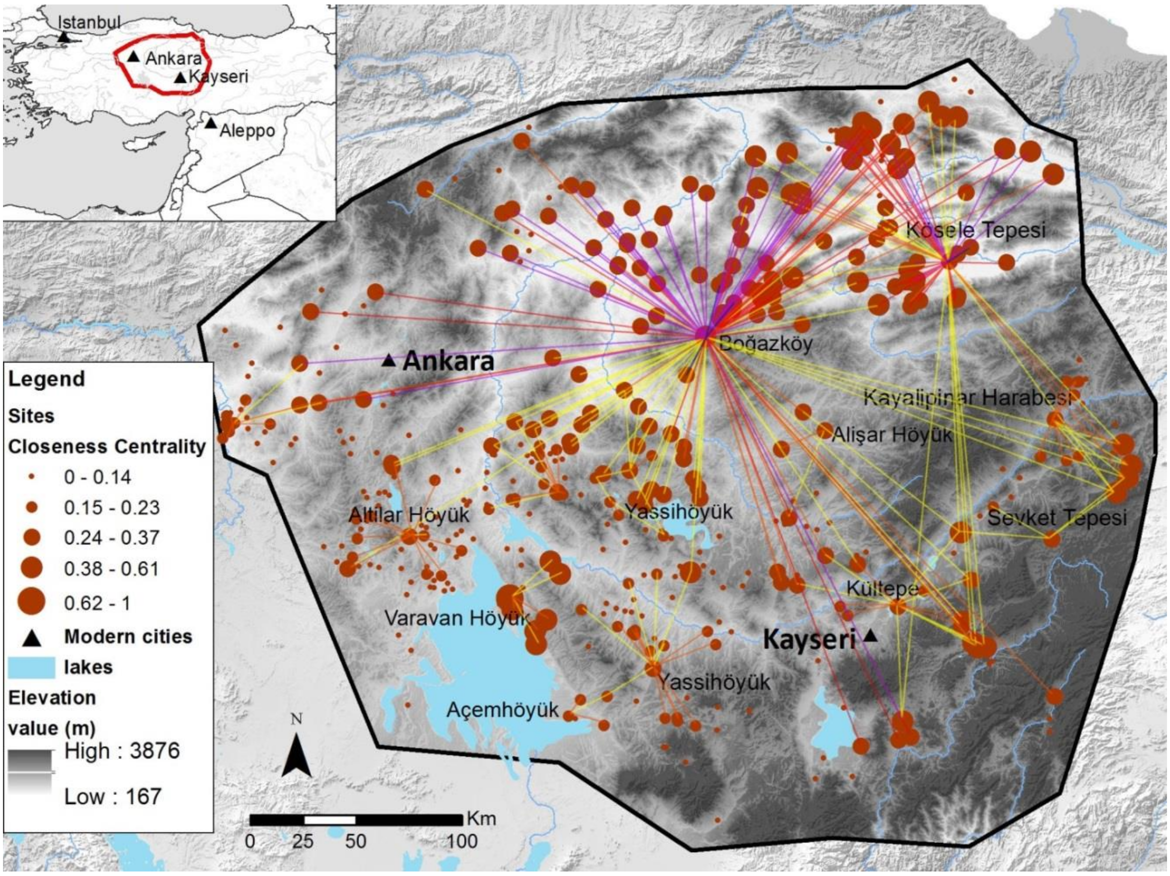

Figure 173. Closeness Centrality values of settlements in central Anatolia. The edges are coloured according to flow, ranging from yellow to blue.

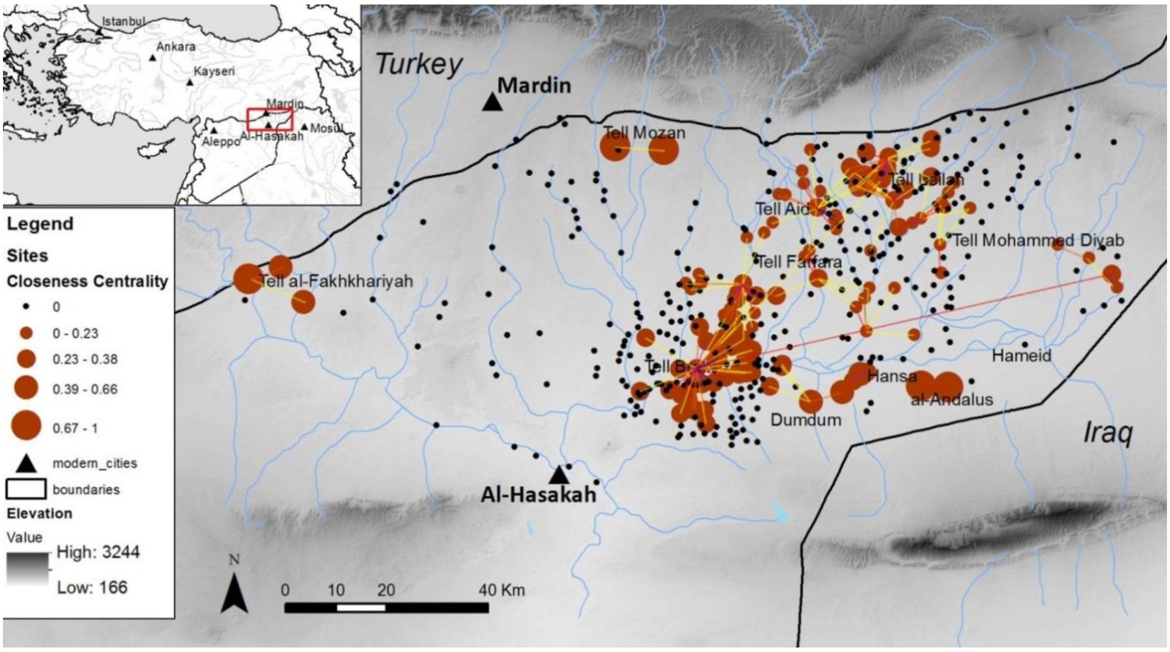

Figure 174. Closeness Centrality values of settlements in the Khabur Triangle. The edges are coloured according to flow, ranging from yellow to blue.

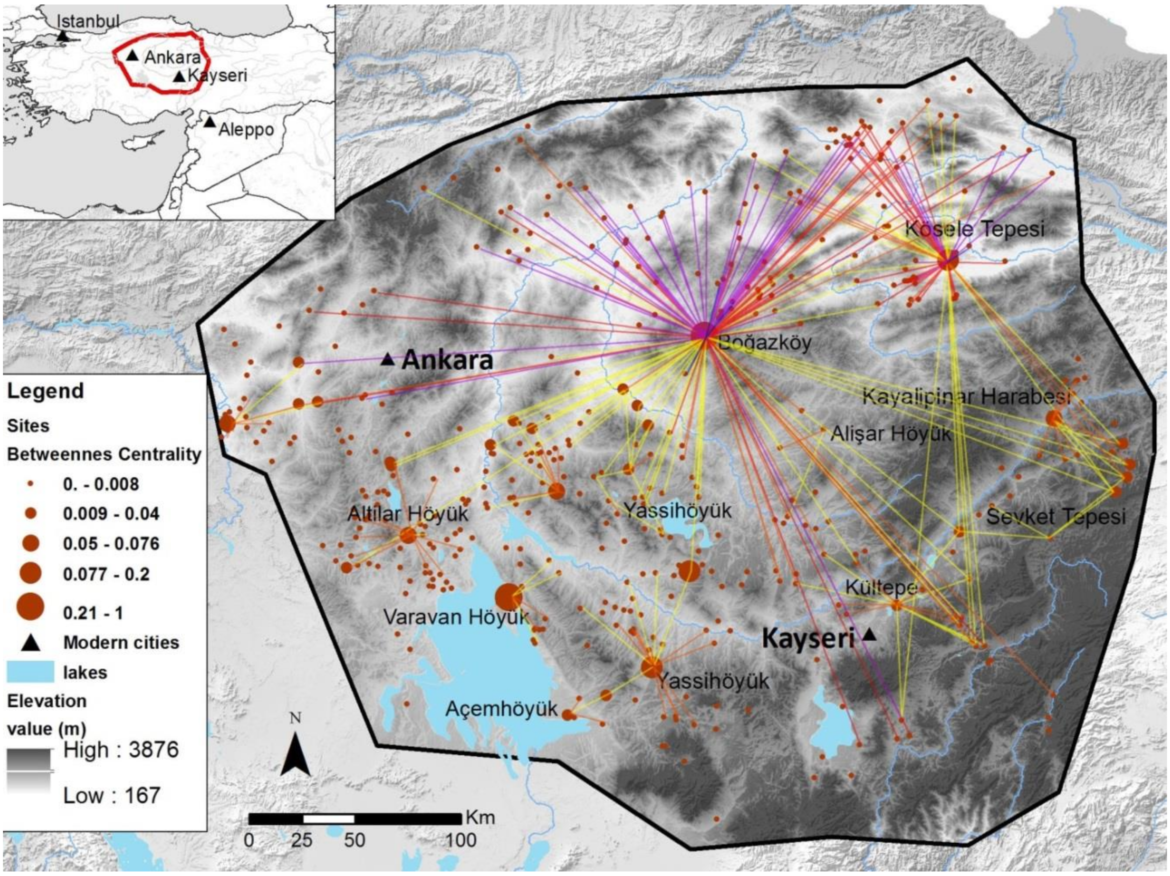

Figure 175. Betweenness Centrality values of settlements in central Anatolia. The edges are coloured according to flow, ranging from yellow to blue.

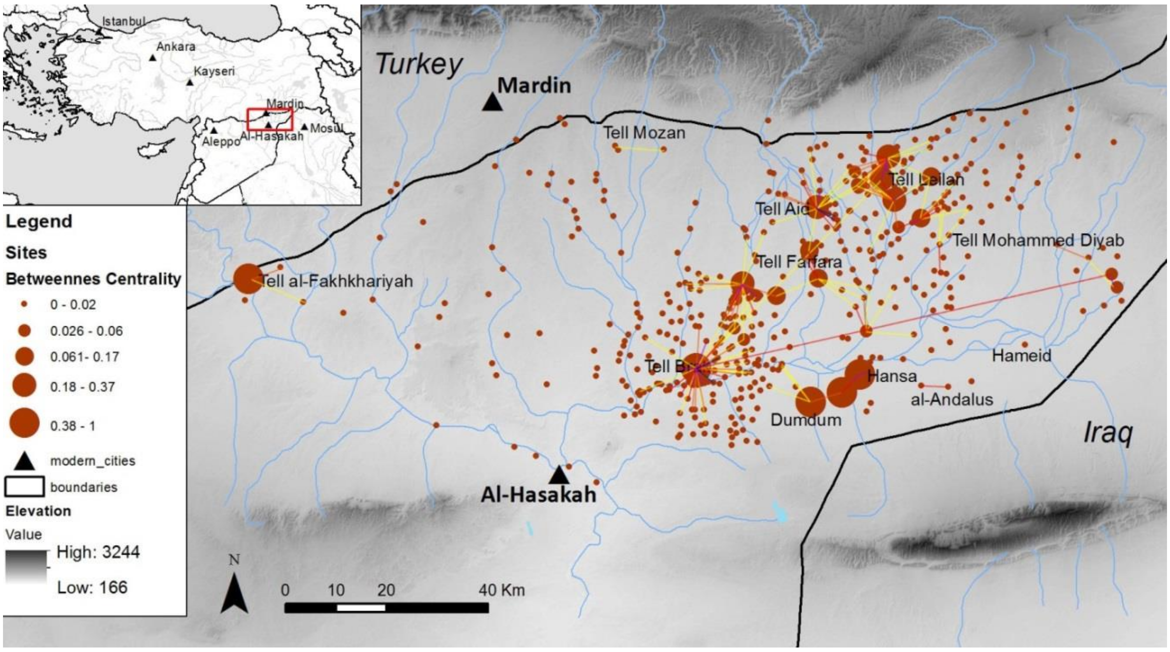

Figure 176. Betweenness Centrality values of settlements in the Khabur Triangle. The edges are coloured according to flow, ranging from yellow to blue.

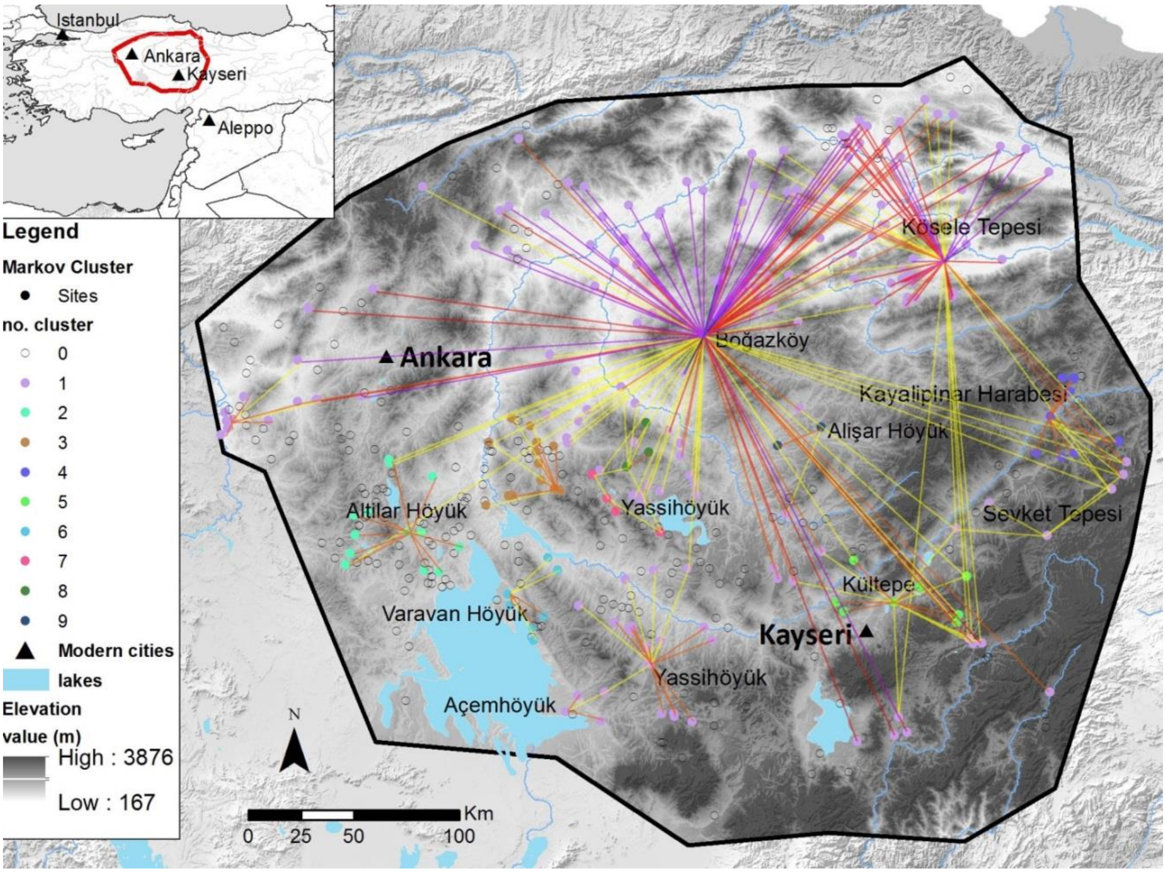

Figure 177. Markov cluster of settlements in central Anatolia. The arcs are coloured according to flow, ranging from yellow to blue. Blank points do not belong to any cluster.

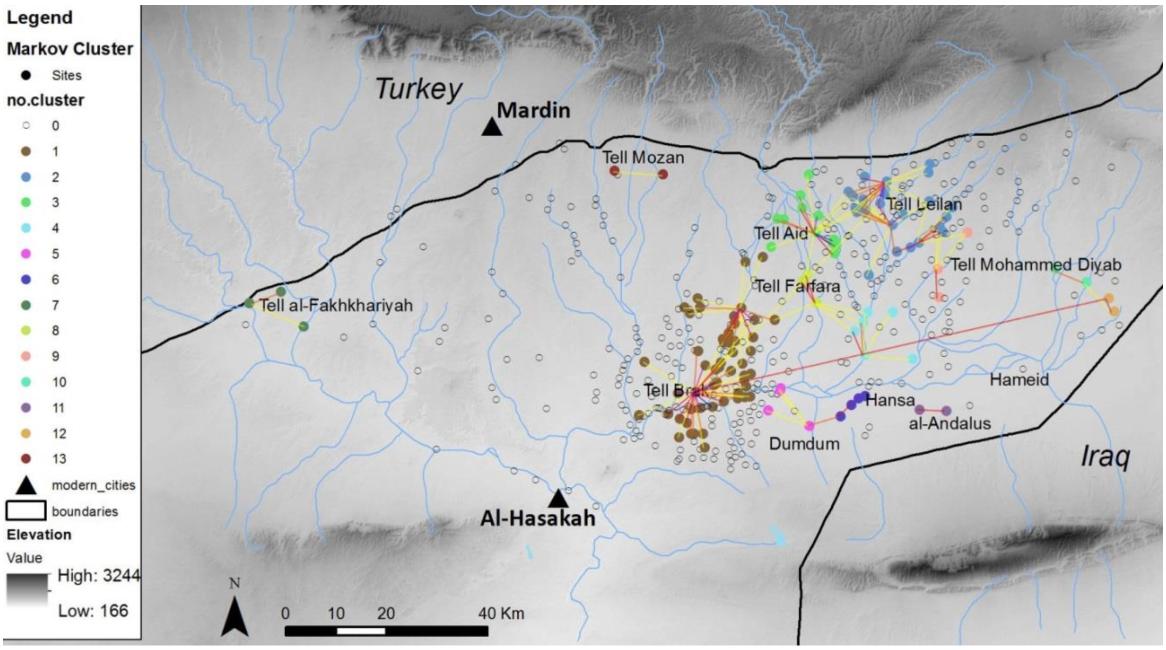

Figure 178. Markov cluster of settlements in the Khabur Triangle. The arcs are coloured according to flow, ranging from yellow to blue. Blank points do not belong to any cluster**.**

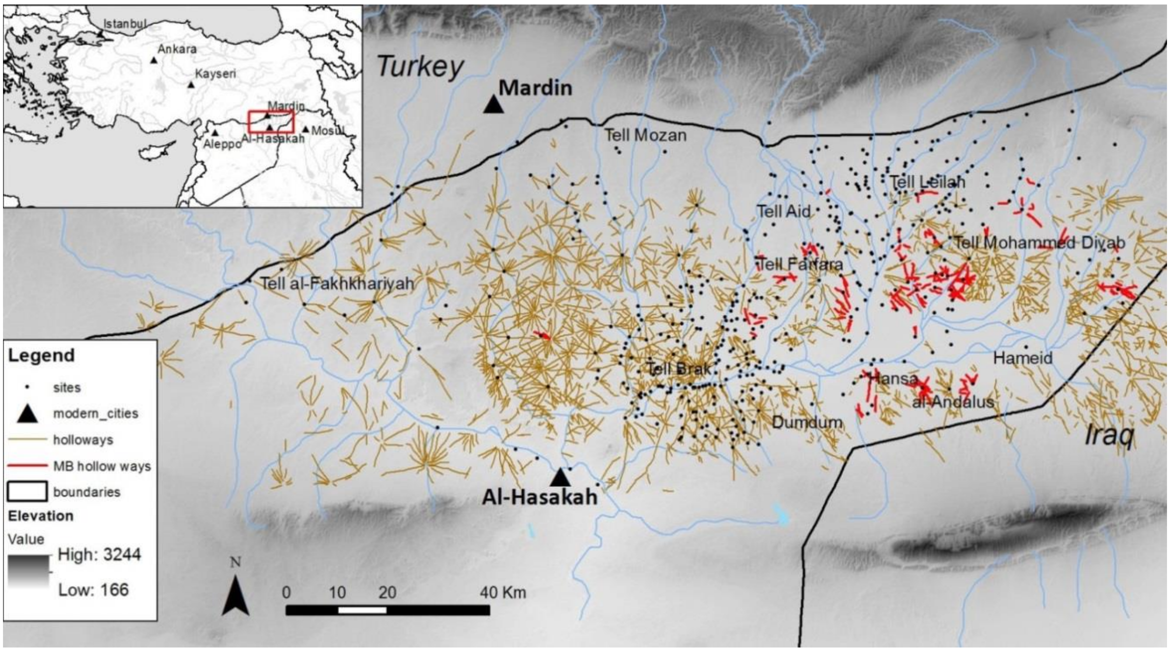

Figure 179. Spatial distribution of hollow ways. In red the hollow ways likely formed during the Middle Bronze Age (ca. 2000 – 1600 BC).

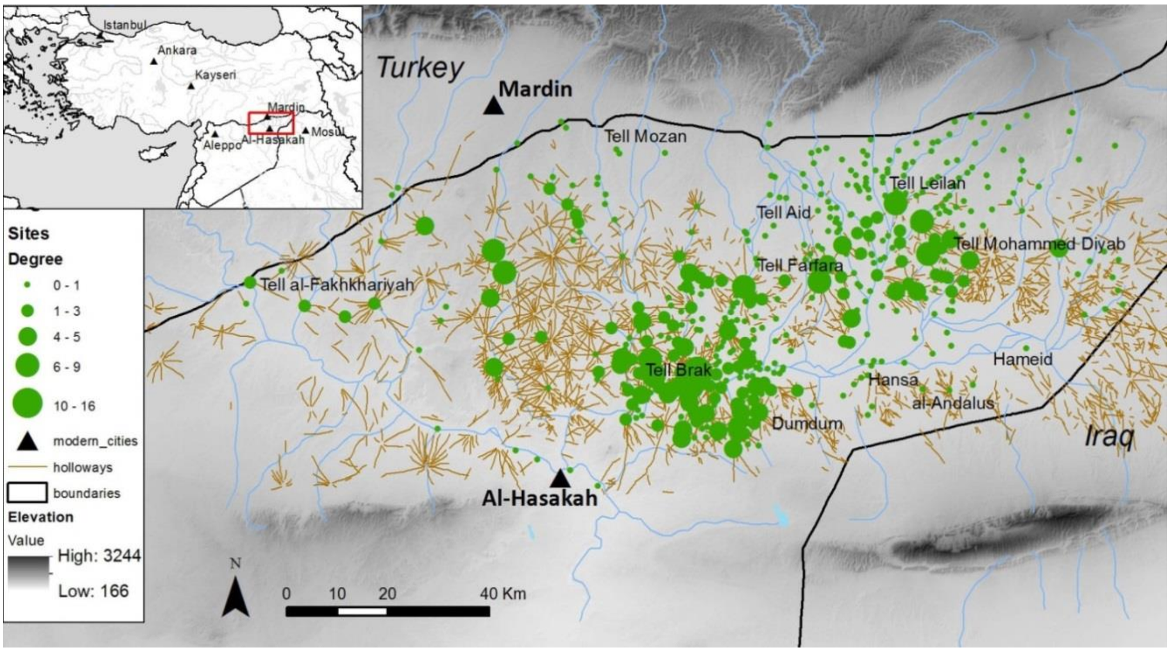

Figure 180. Degree values of settlements connected by hollow ways in the Khabur Triangle.

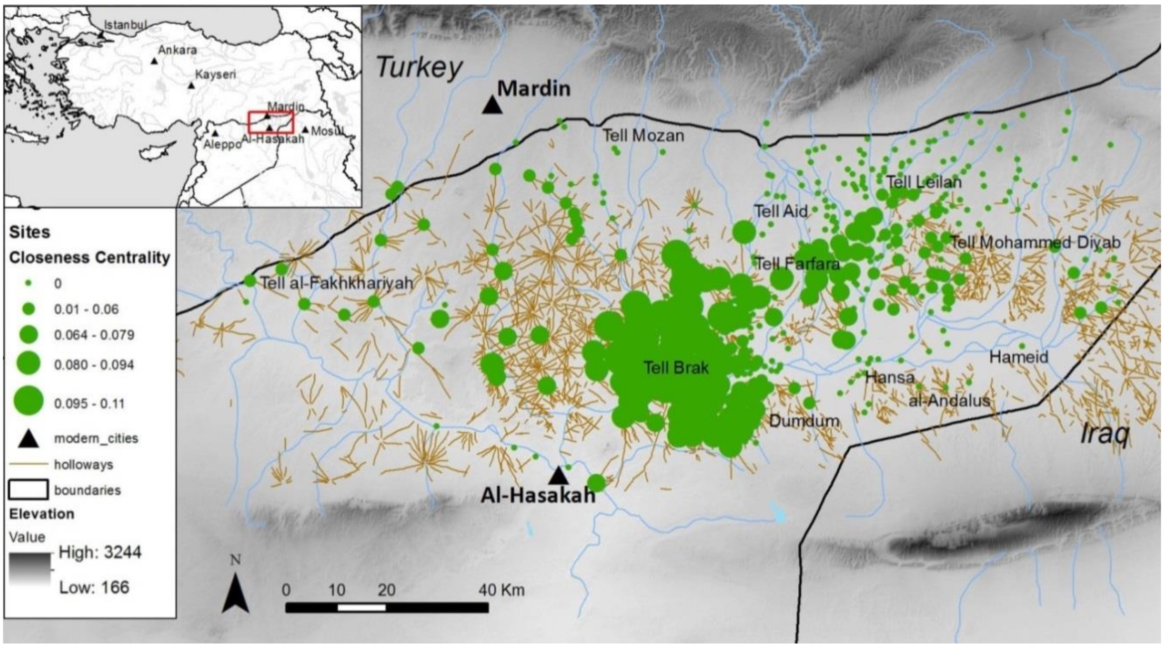

Figure 181. Closeness Centrality of settlements connected by hollow ways in the Khabur Triangle.

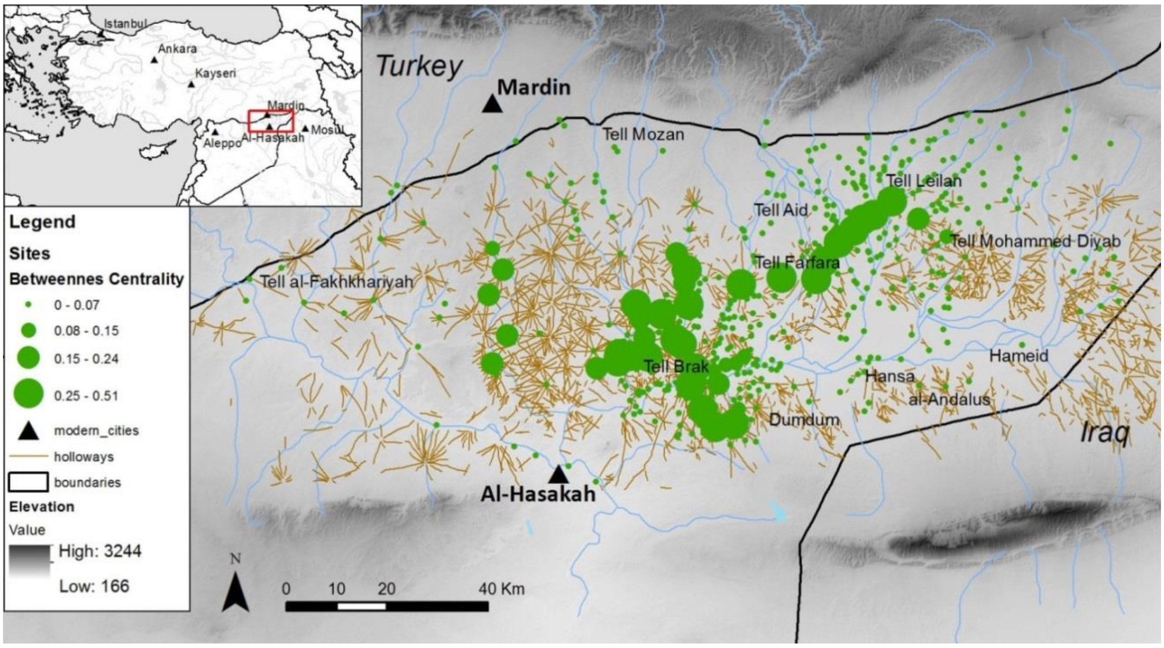

Figure 182. Betweenness Centrality of settlements connected by hollow ways in the Khabur Triangle.

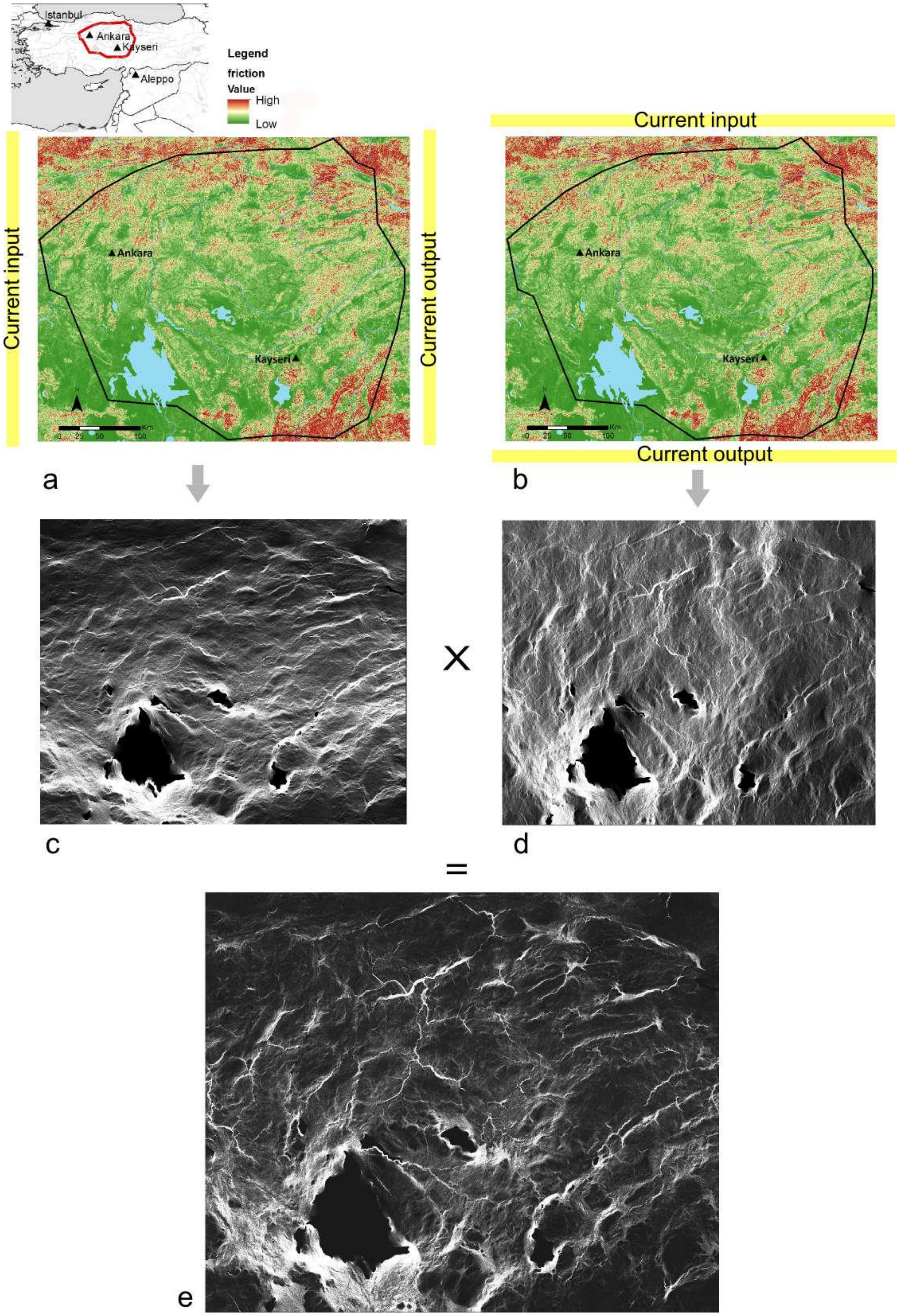

Figure 183. Circuitscape calculates current density by conducting current through a resistance surface (friction map).Straight parallel regions allow current to flow through the best paths for the east-west directional run (a and c) and for the north-south directional run (b and d).Panel (e): omnidirectional connectivity map calculated by multiplying the two grids c and d.

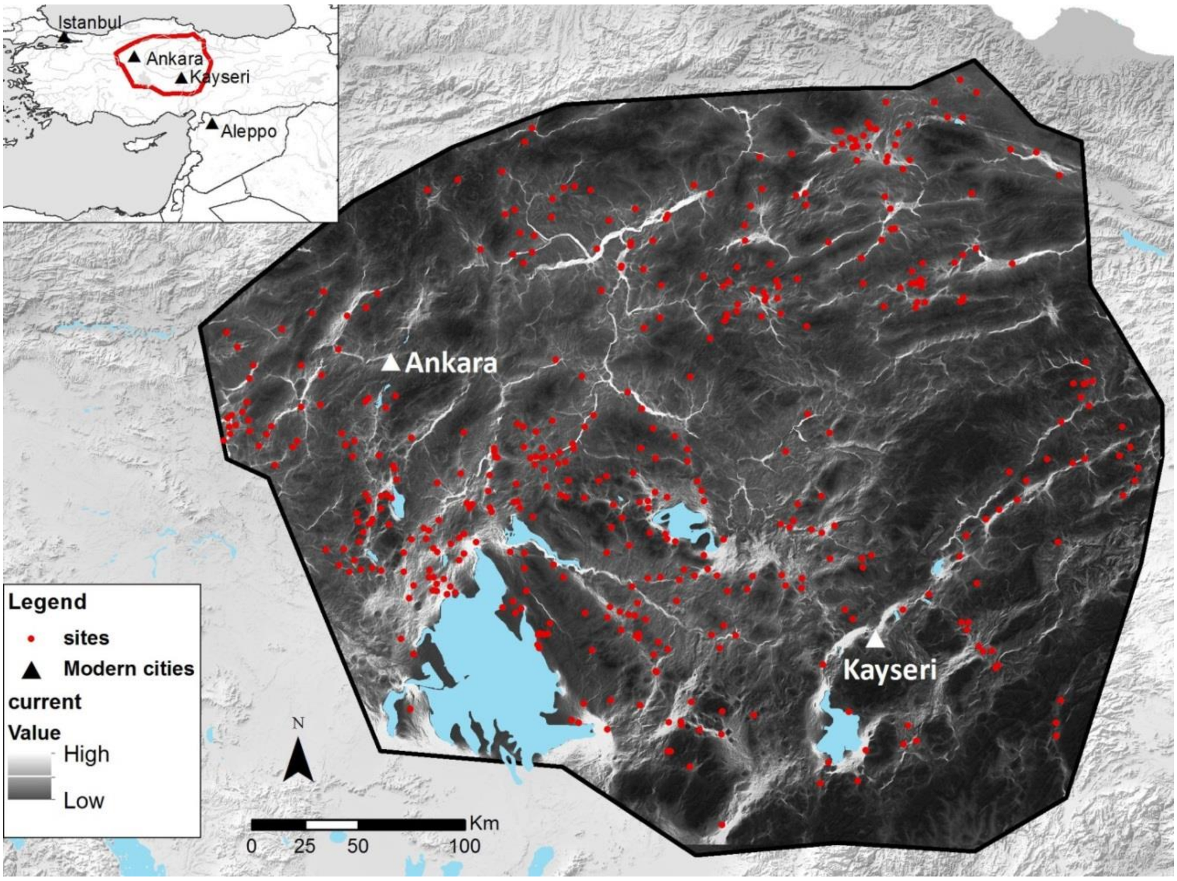

Figure 184. Omnidirectional connectivity map for central Anatolia.

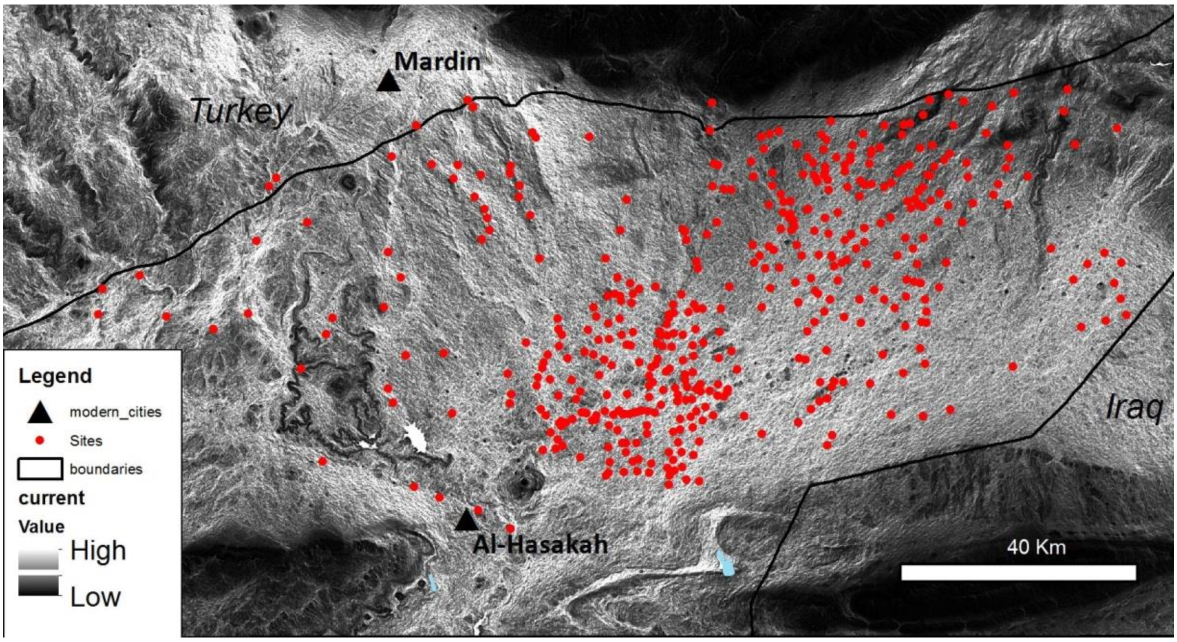

Figure 185. Omnidirectional connectivity map for the Khabur Triangle.

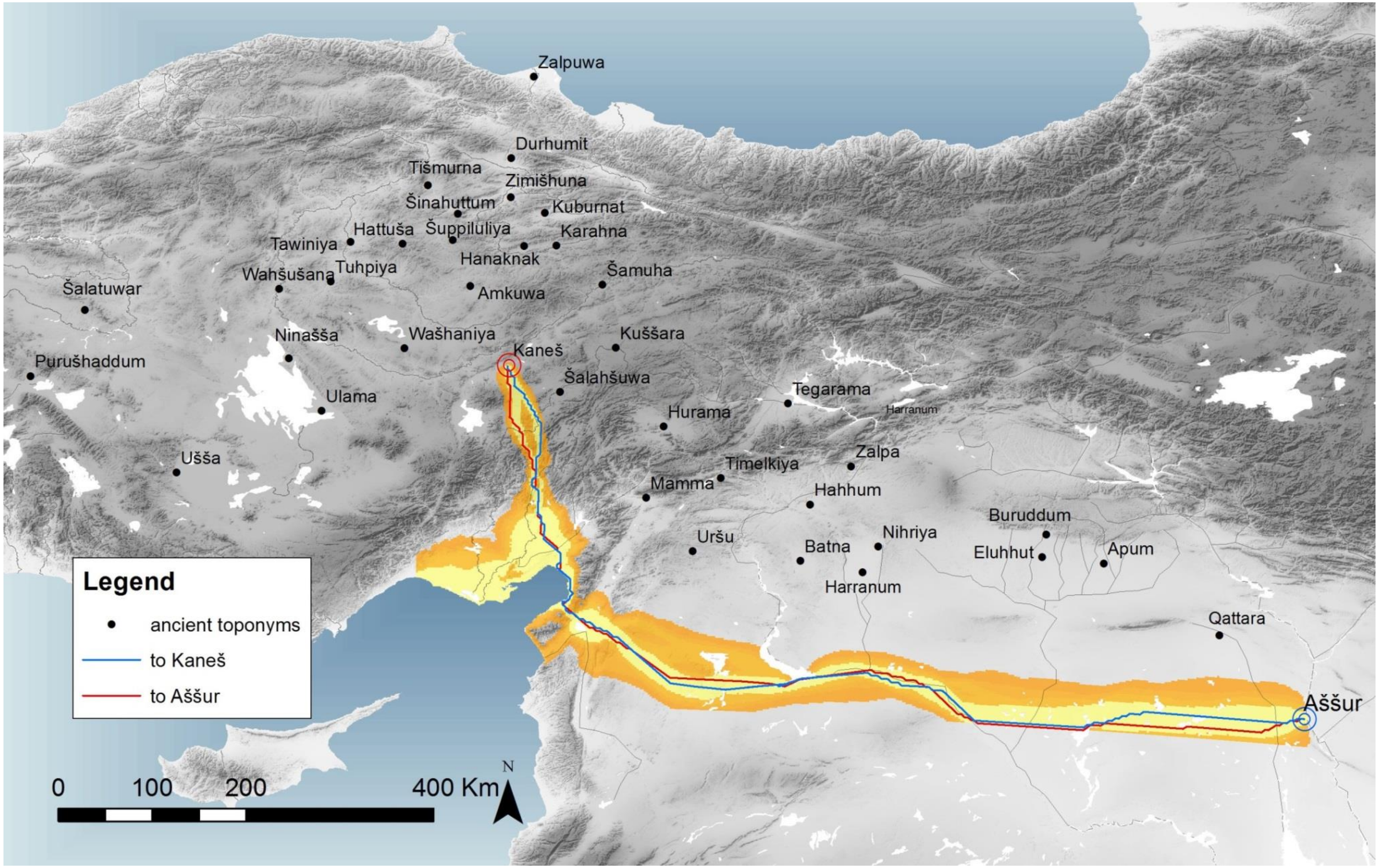

Figure 186. Least-cost paths and corridors between Aššur and Kaneš in scenario 1. Lighter shades indicate lower cumulative movement cost.

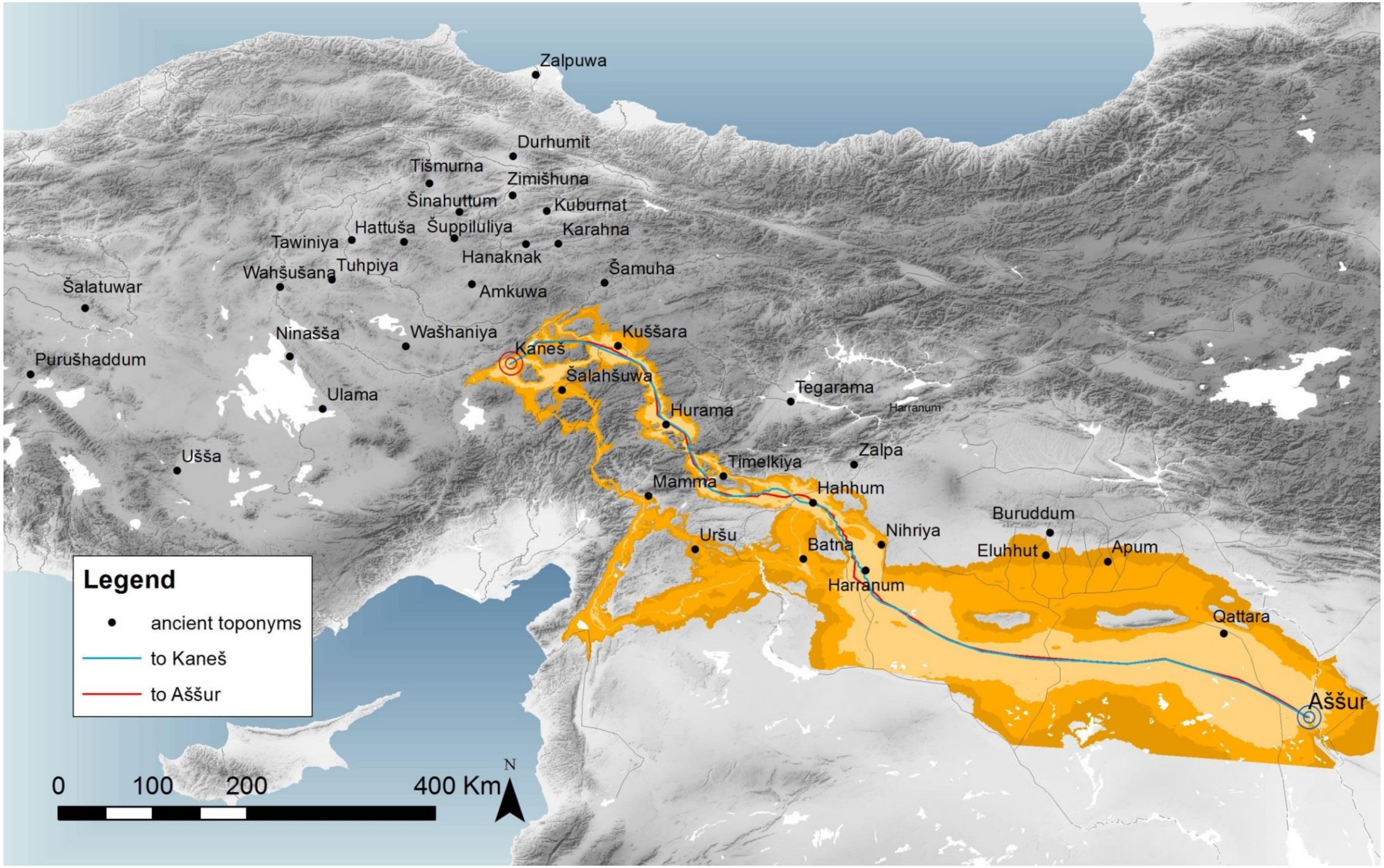

Figure 187. Least-cost paths and corridors between Aššur and Kaneš in scenario 2. Lighter shades indicate lower cumulative movement cost.

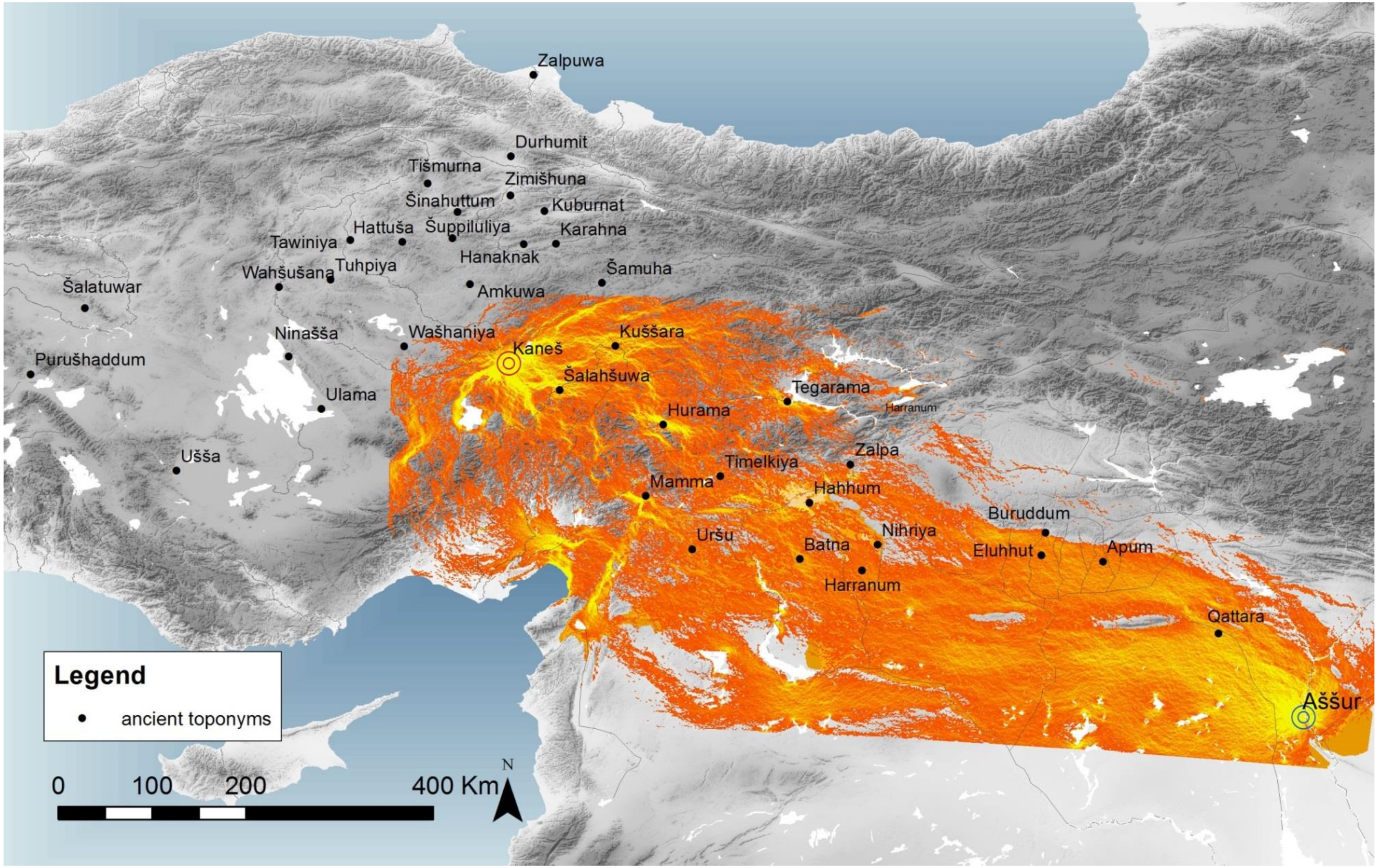

Figure 188. Current map between corridors between Aššur and Kaneš in scenario 1. Higher current densities (lighter shades) indicate cells with higher net passage probabilities for random walkers.

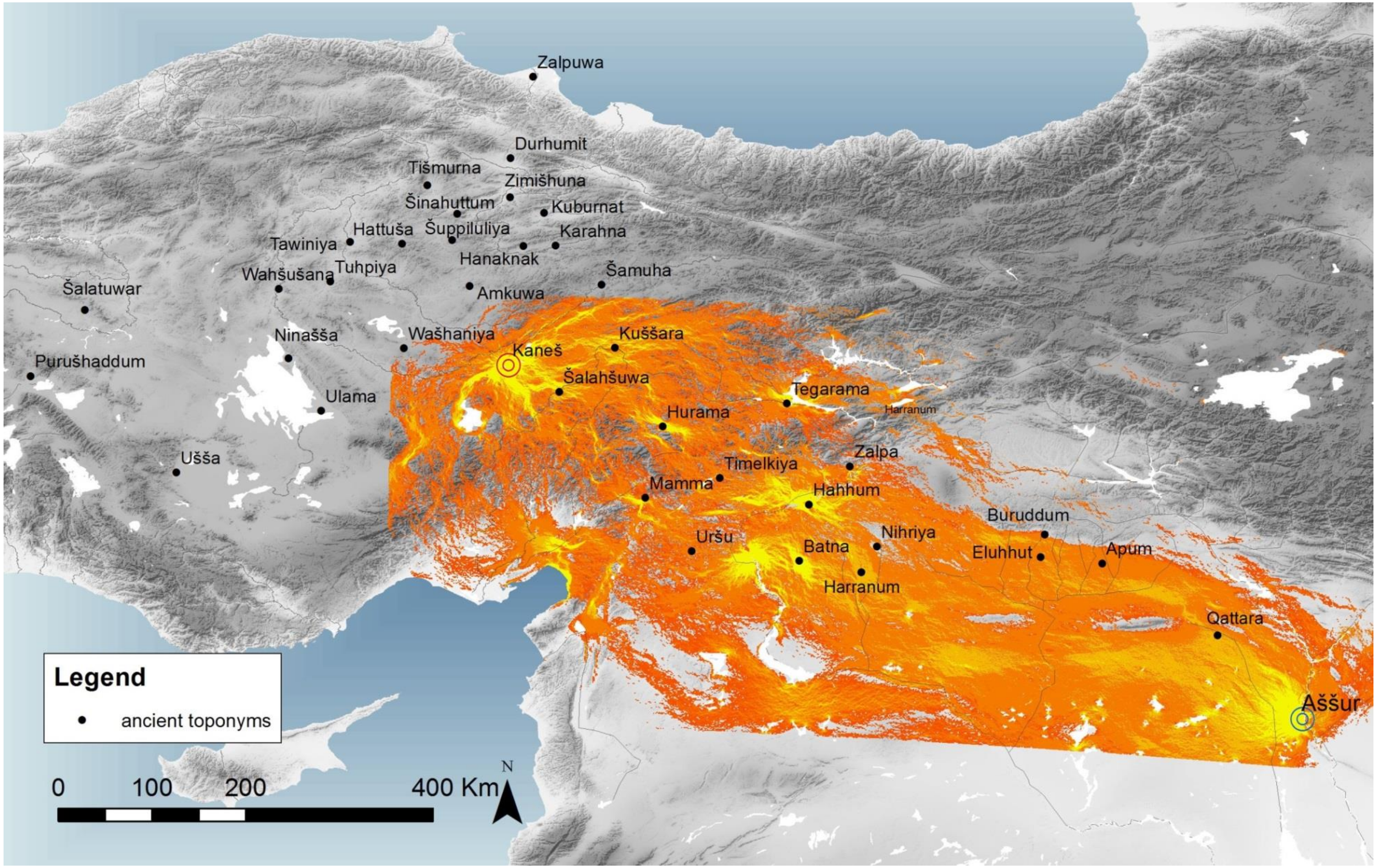

Figure 189. Current map between corridors between Aššur and Kaneš in scenario 2. Higher current densities (lighter shades) indicate cells with higher net passage probabilities for random walkers.

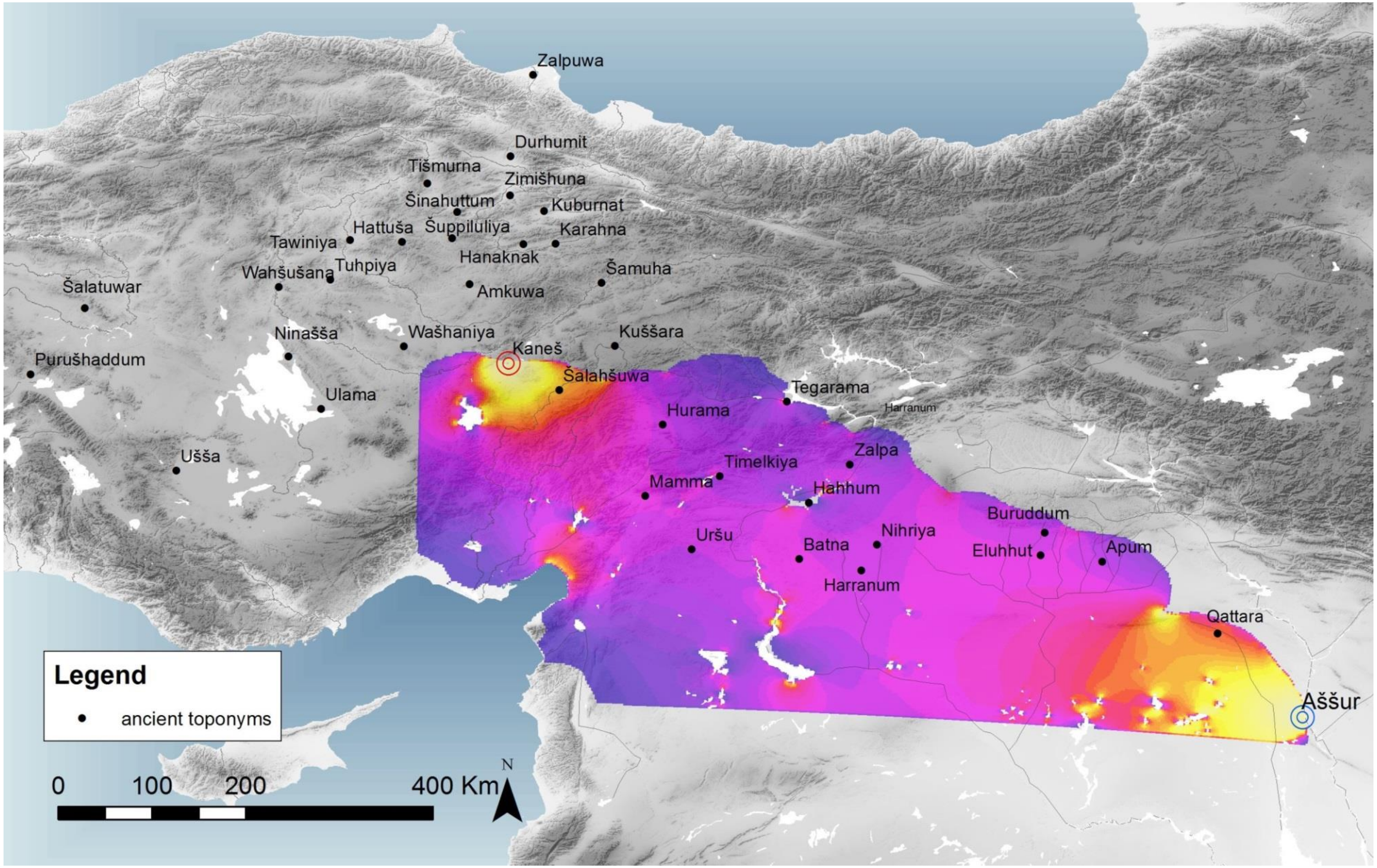

Figure 190. Map highlighting ‘‘pinch points,’’ or critical habitat connections, between Aššur and Kaneš in scenario 1. Higher current densities (lighter shades) indicate cells with higher net passage probabilities for random walkers.

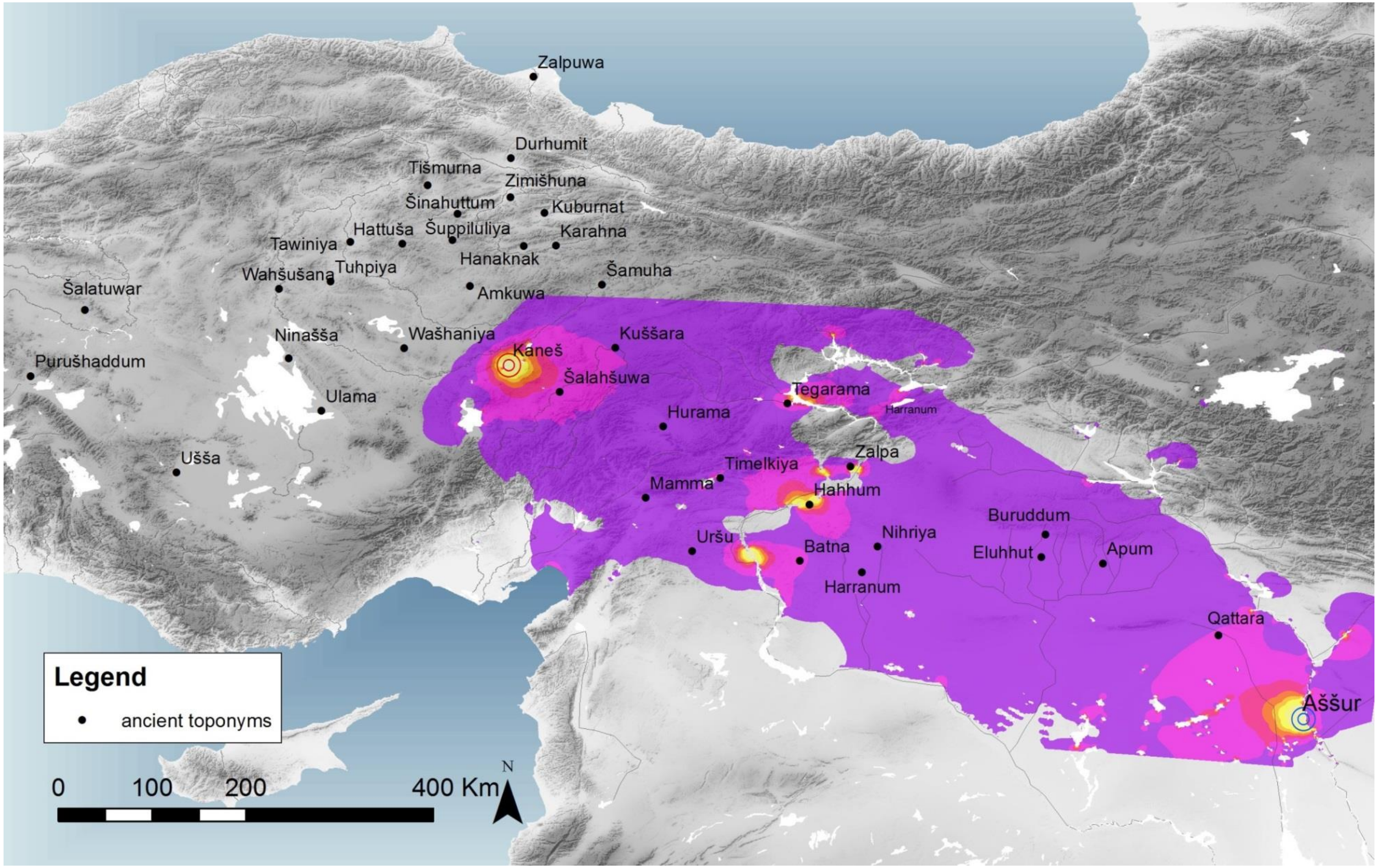

Figure 191. Map highlighting ''pinch points,'' or critical habitat connections, between Aššur and Kaneš in scenario 2. Higher current densities (lighter shades) indicate cells with higher net passage probabilities for random walkers.

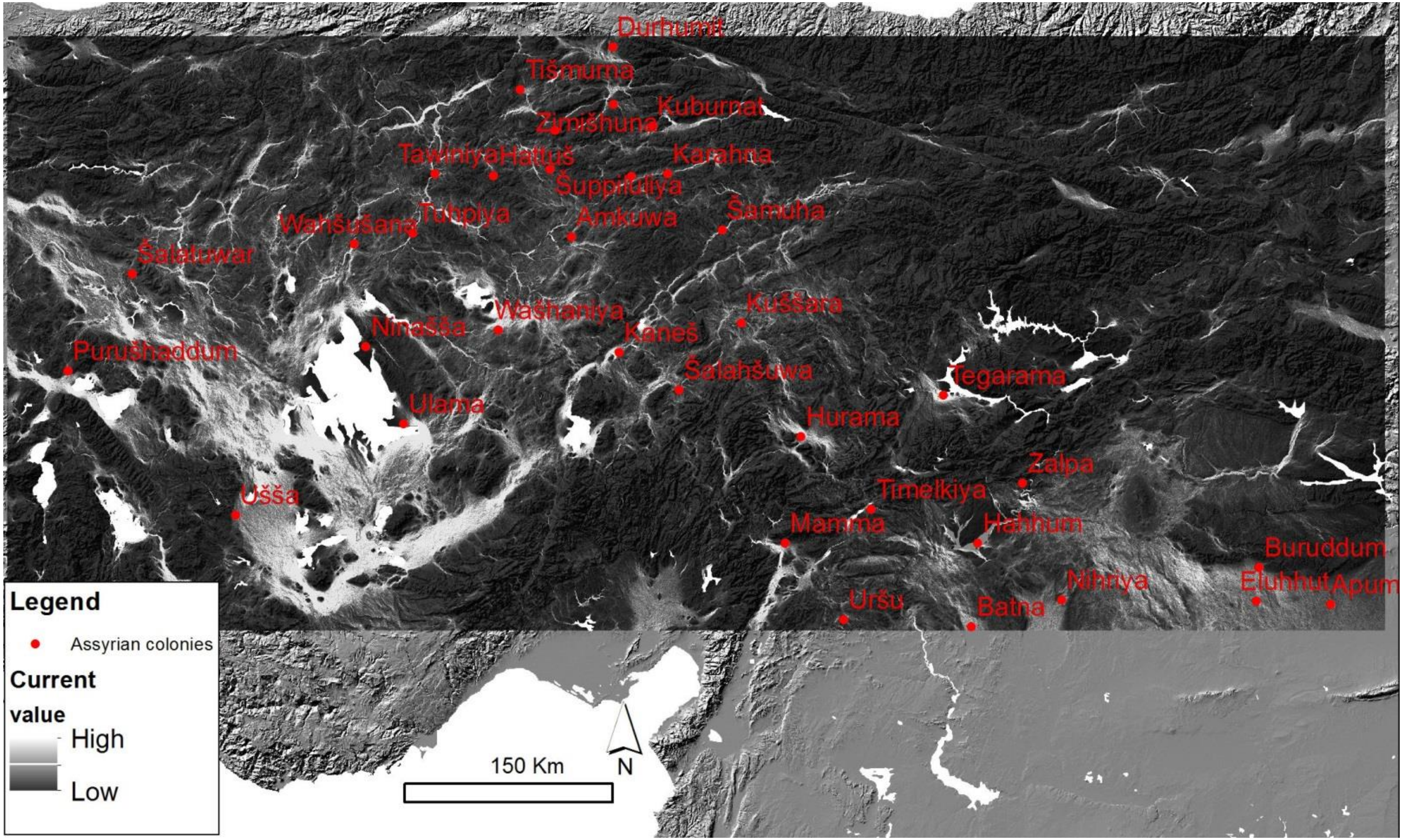

Figure 192. Omnidirectional connectivity map and spatial distribution of Old Assyrian colonies.

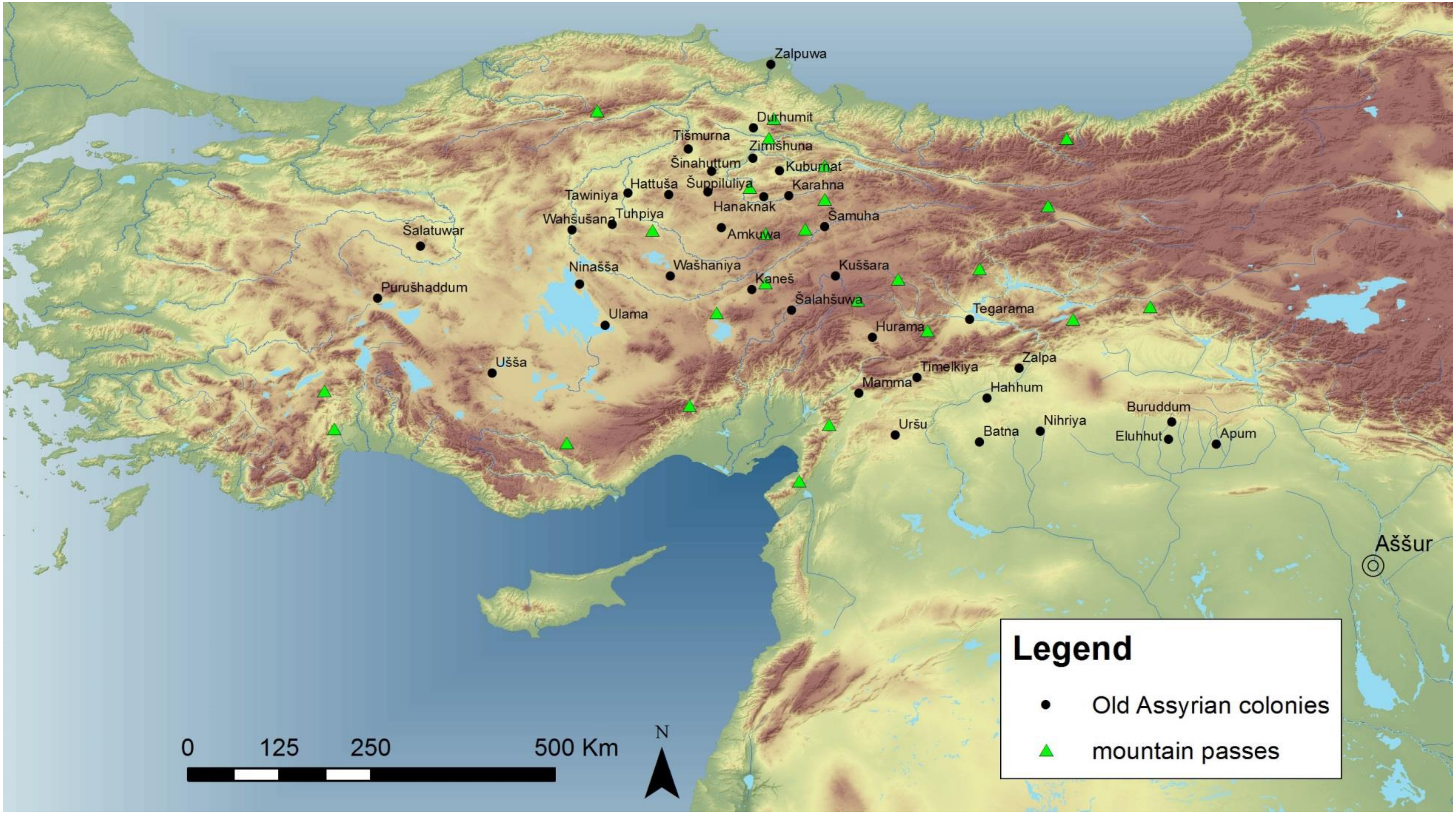

Figure 193. Locations of mountain passes and Old Assyrian commercial settlements.

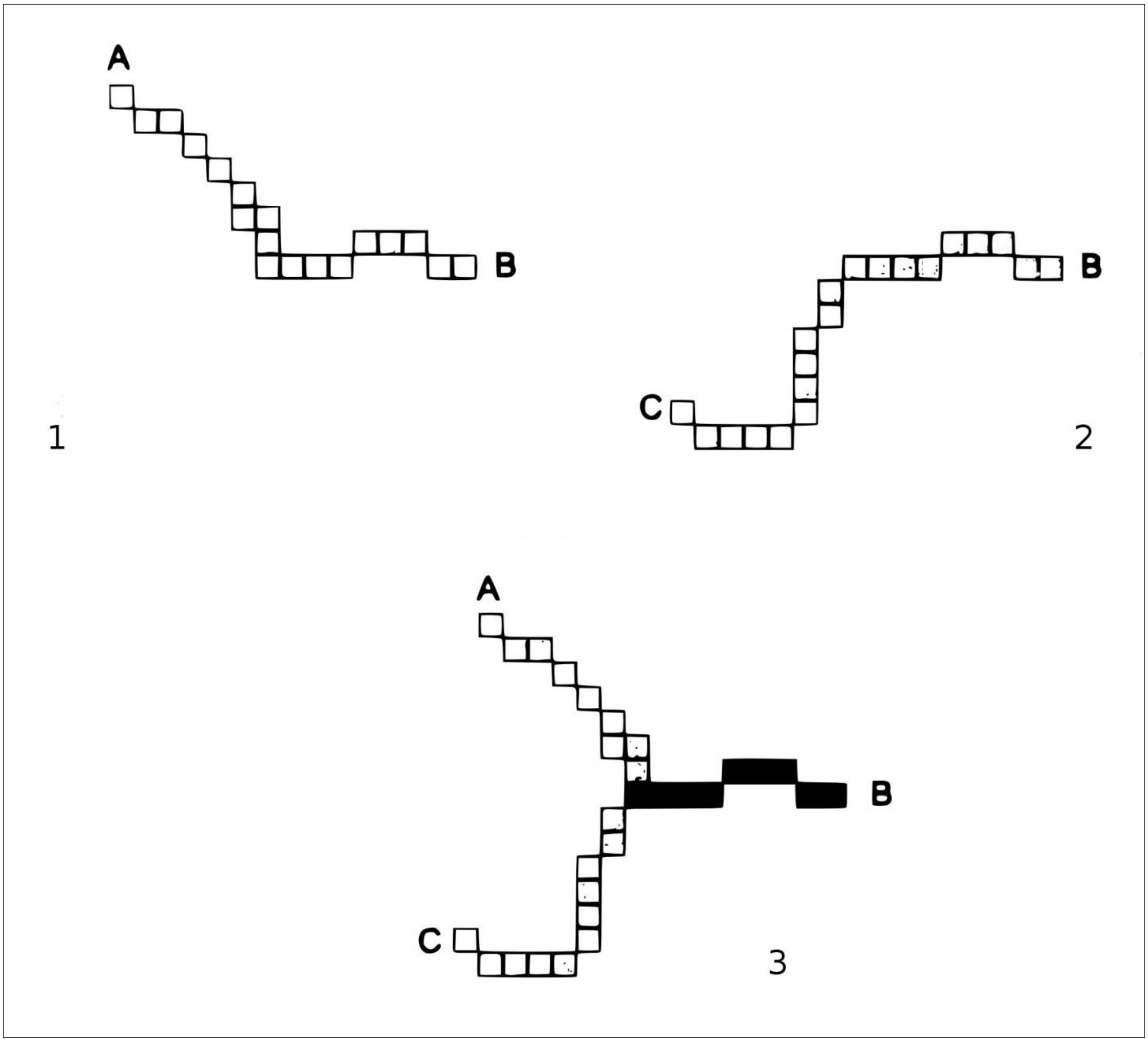

Figure 194. Cumulative pathway analysis to site B from sites A and C: where the two paths overlap the corresponding pixels are given a value of 2, shown here as a darker cell (modified from Bell *et al.* 2002, fig. 2).

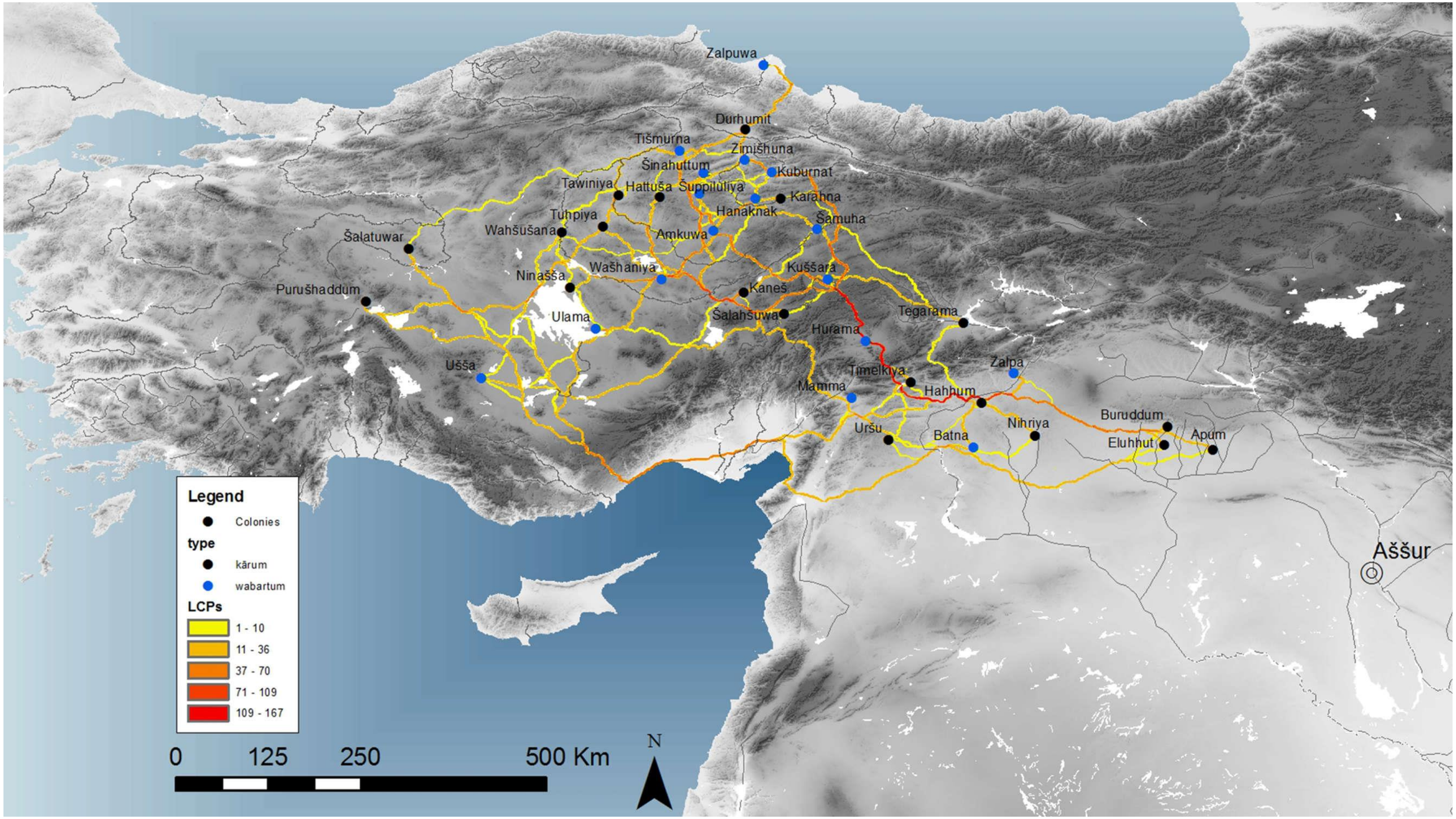

Figure 195. Cumulative least cost paths (LCP) for each pair of Old Assyrian commercial settlements. Darker values (red) indicate cells with the highest number of overlapping paths. Barjamovic's model for Kültepe's lower town level II period (ca. 1970-1835 BC).

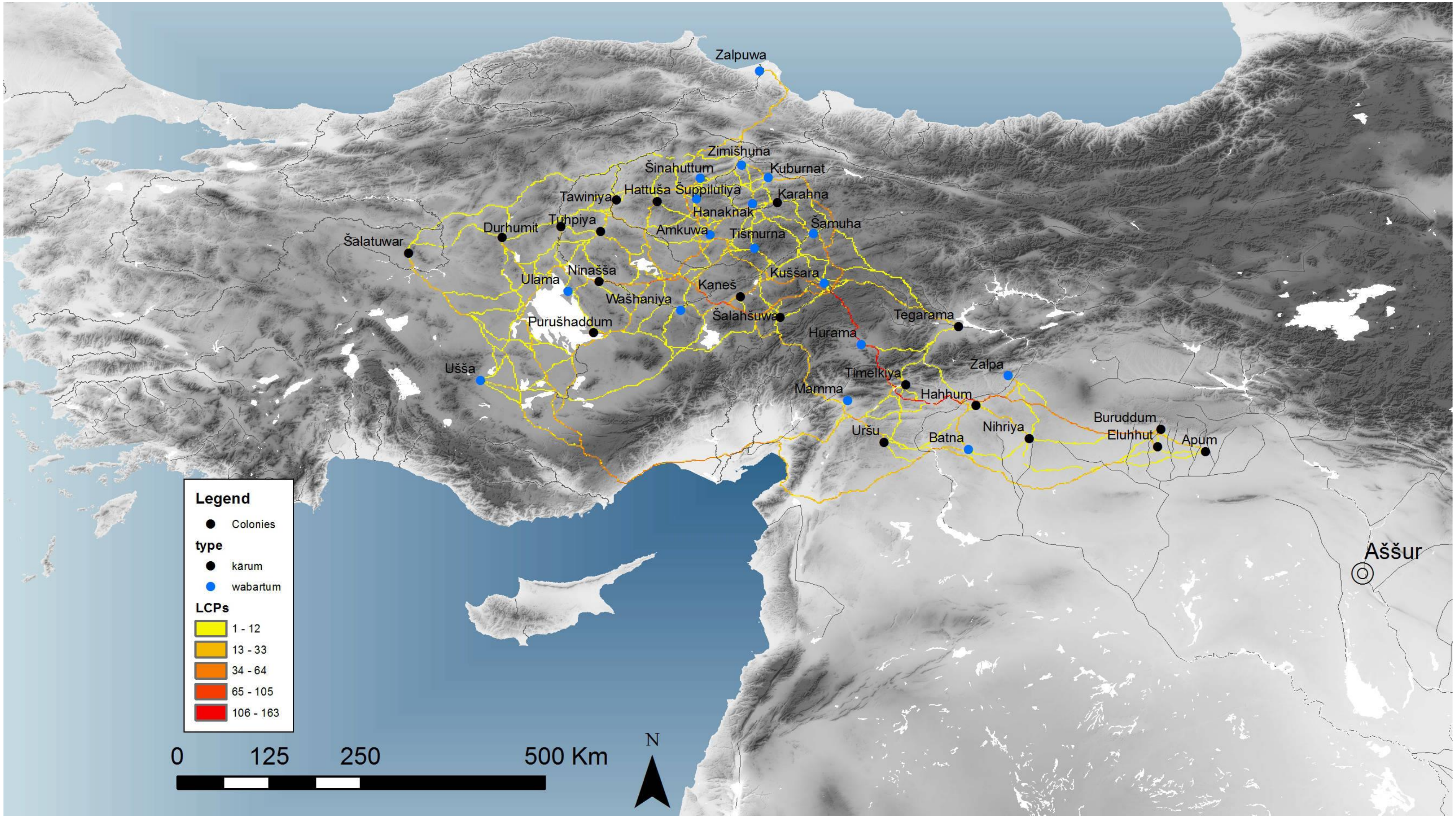

Figure 196. Cumulative least cost paths (LCP) for each pair of Old Assyrian commercial settlements. Darker values (red) indicate cells with the highest number of overlapping paths. Forlanini's model for Kültepe's lower town level II period (ca. 1970-1835 BC).

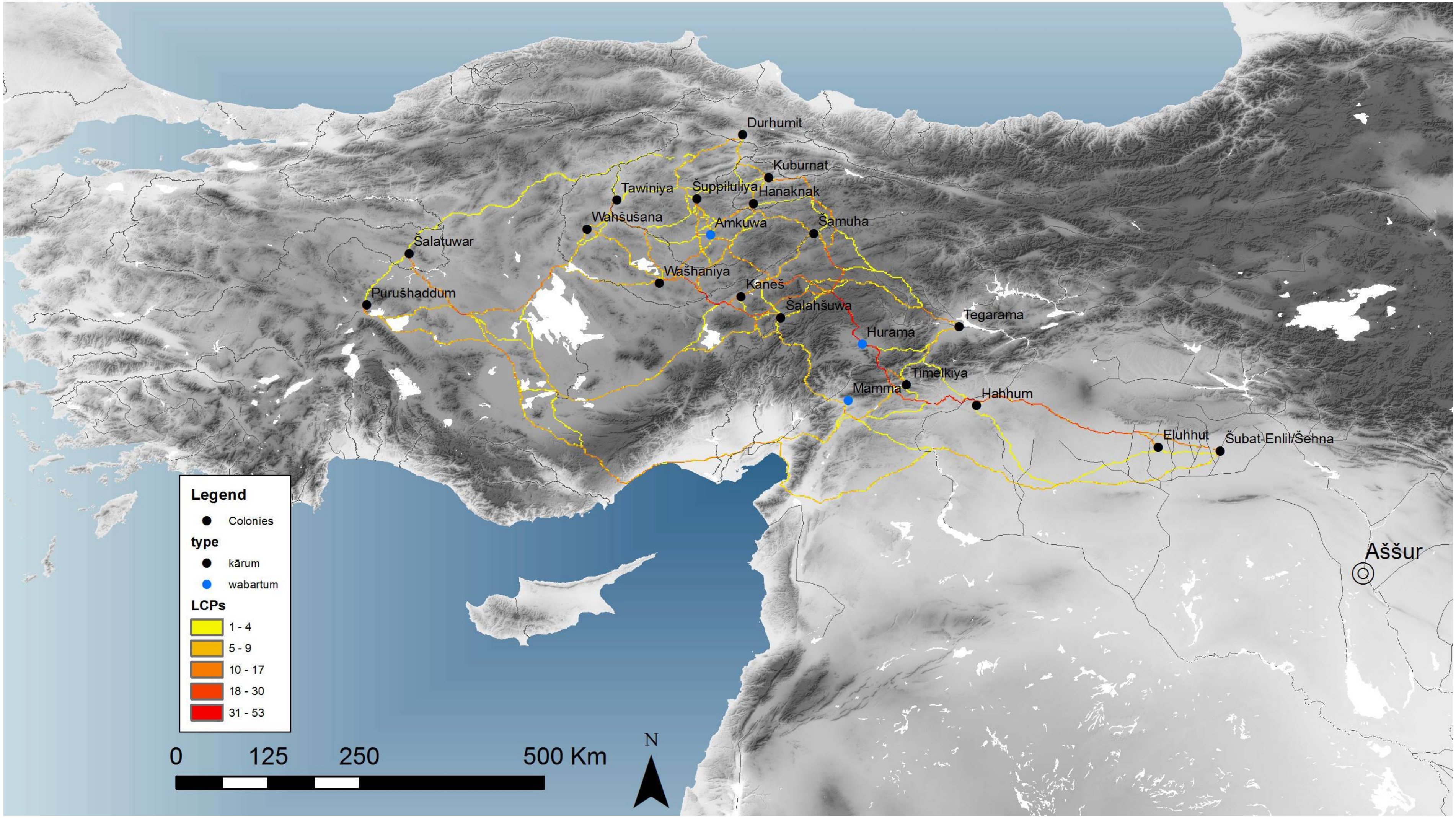

Figure 197. Cumulative least cost paths (LCP) for each pair of Old Assyrian commercial settlements. Darker values (red) indicate cells with the highest number of overlapping paths. Barjamovic's model for Kültepe's lower town level Ib period (ca. 1835-17th c. BC).

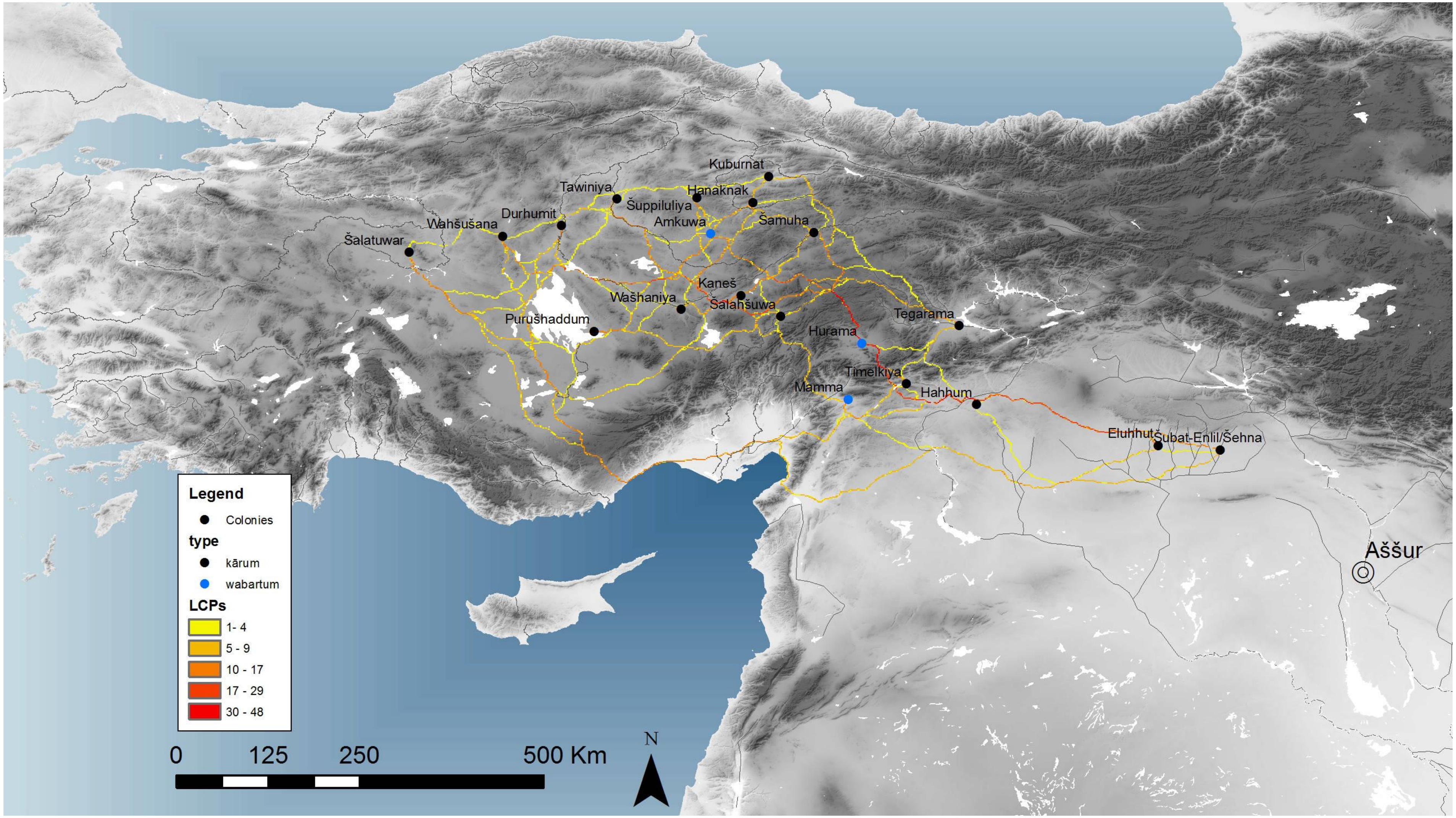

Figure 198. Cumulative least cost paths (LCP) for each pair of Old Assyrian commercial settlements. Darker values (red) indicate cells with the highest number of overlapping paths. Forlanini's model for Kültepe's lower town level Ib period (ca. 1835-17th c. BC).

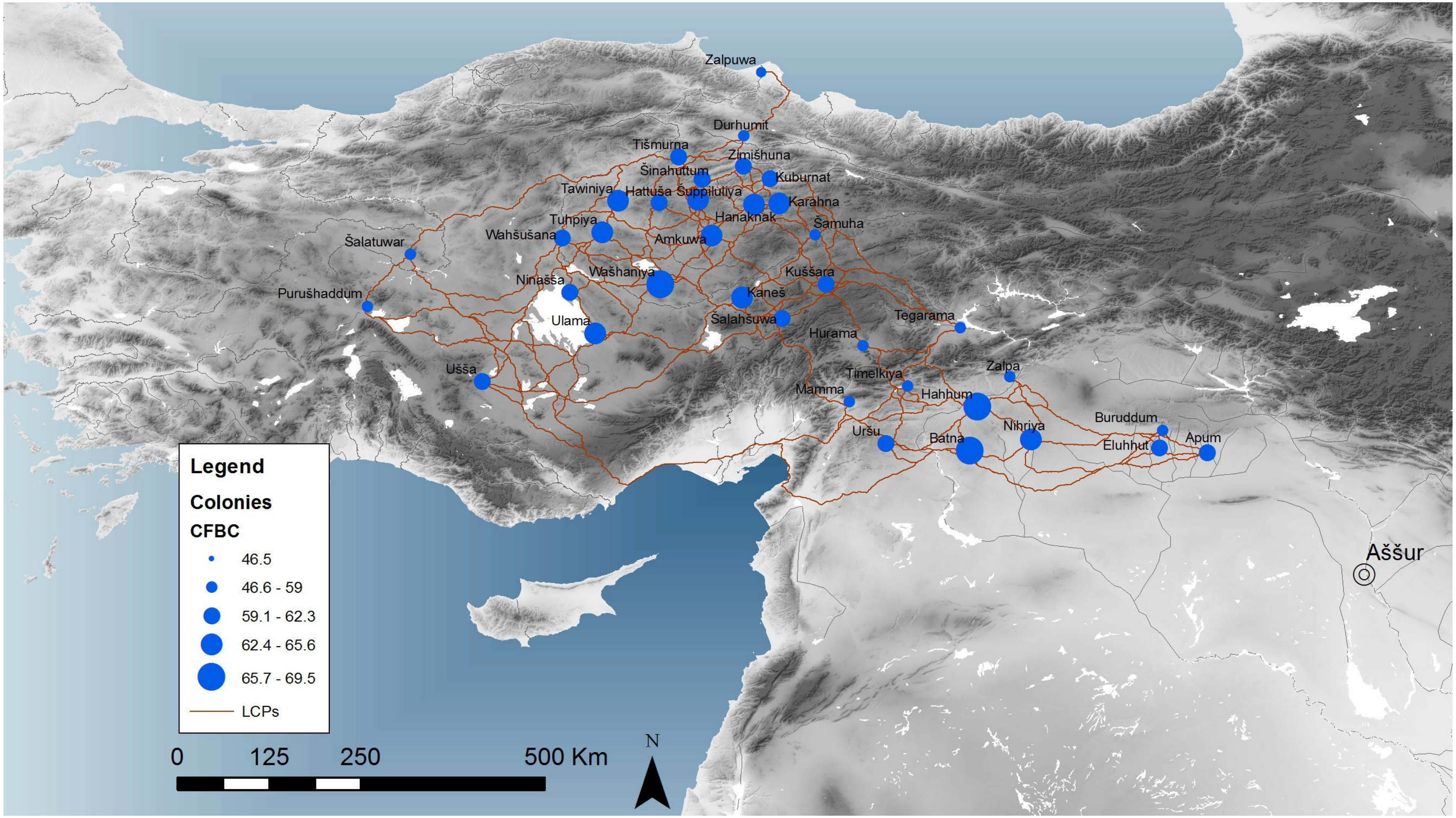

Figure 199. Current Flow Beetweenness Centrality (CFBC) of Old Assyrian commercial settlements. Barjamovic's model for Kültepe's lower town level II period (ca. 1970-1835 BC).

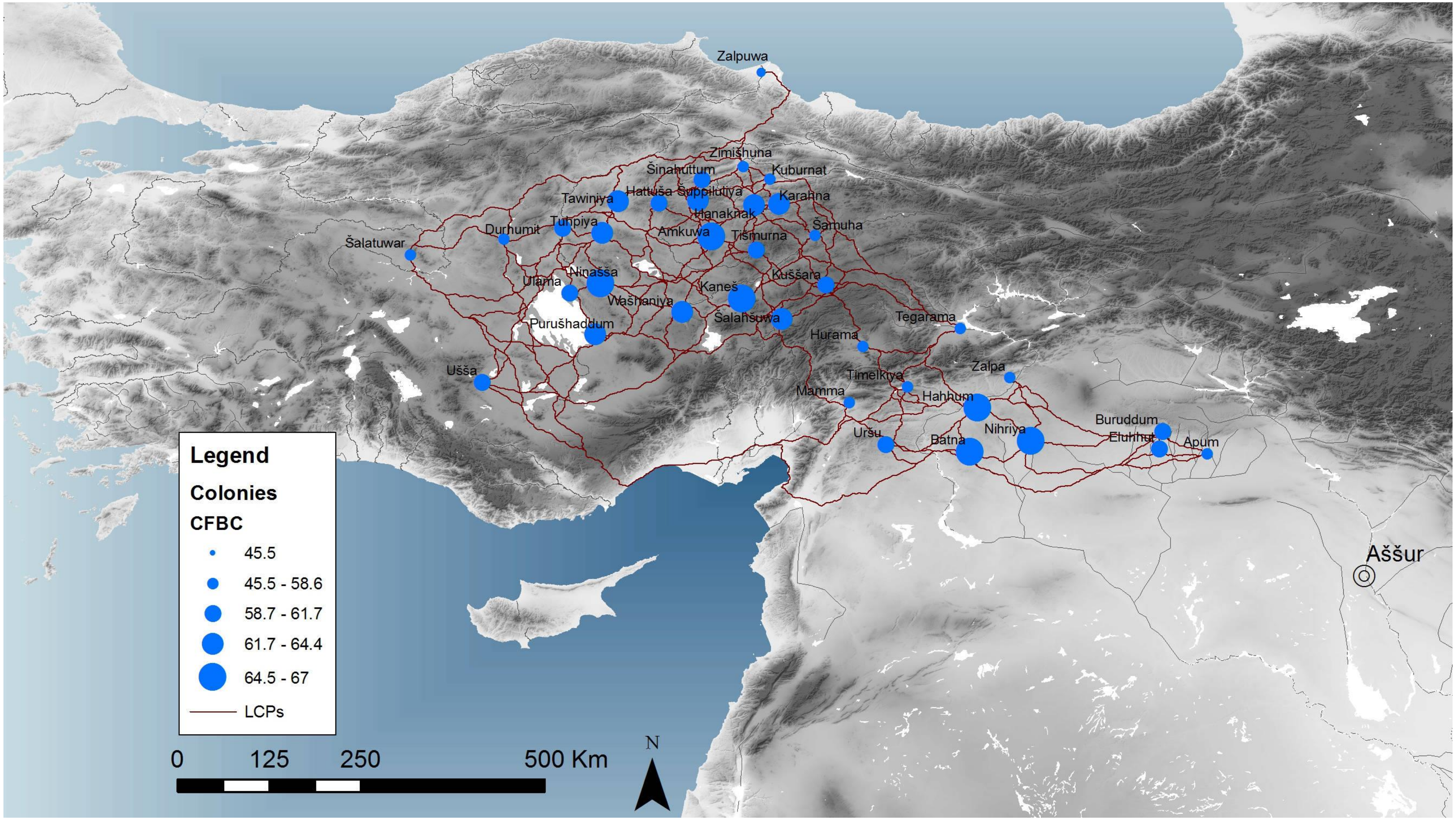

Figure 200. Current Flow Beetweenness Centrality (CFBC) of Old Assyrian commercial settlements. Forlanini's model for Kültepe's lower town level II period (ca. 1970-1835 BC).

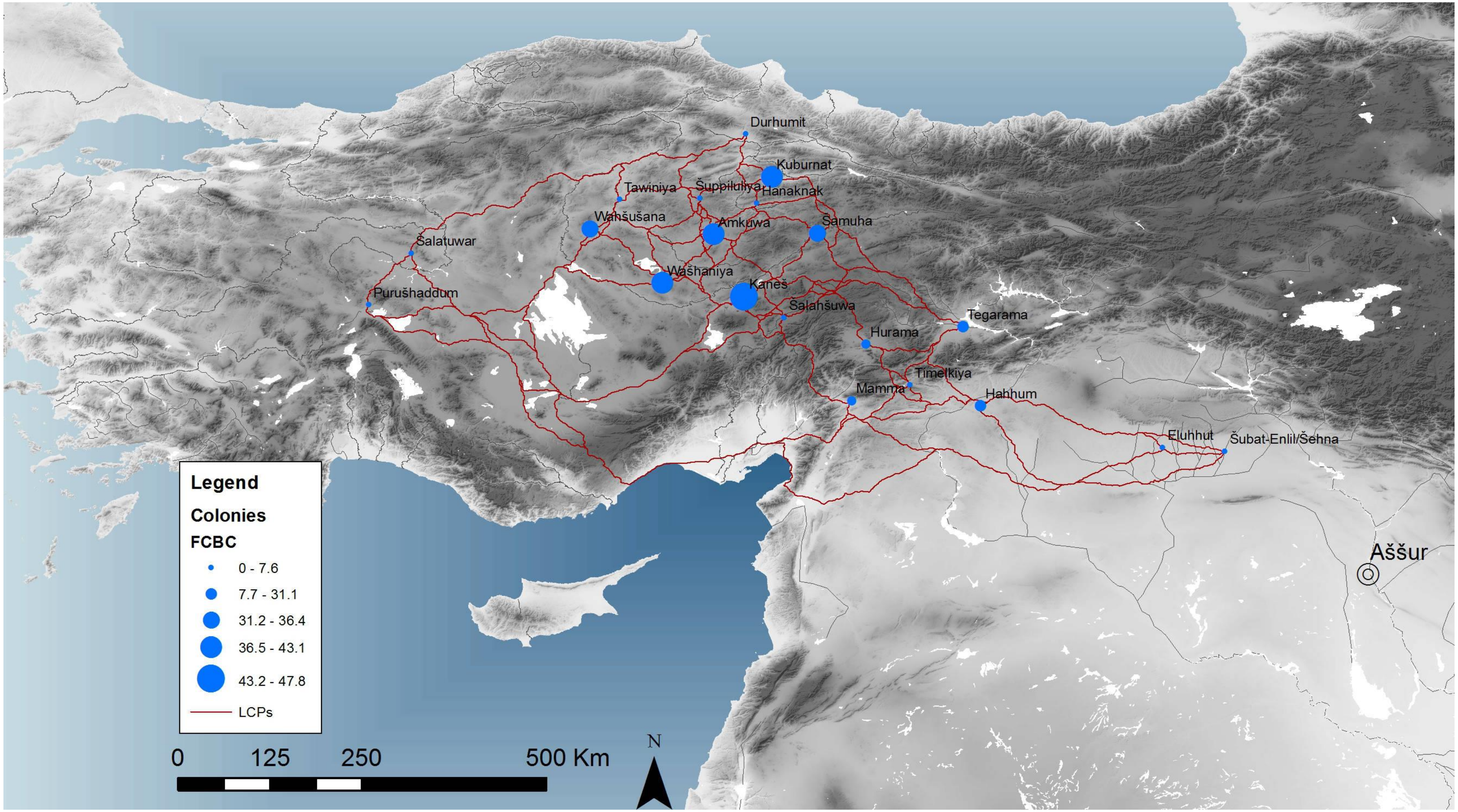

Figure 201. Current Flow Beetweenness Centrality (CFBC) of Old Assyrian commercial settlements. Barjamovic's model for Kültepe's lower town level Ib period (ca. 1835-17th c. BC).

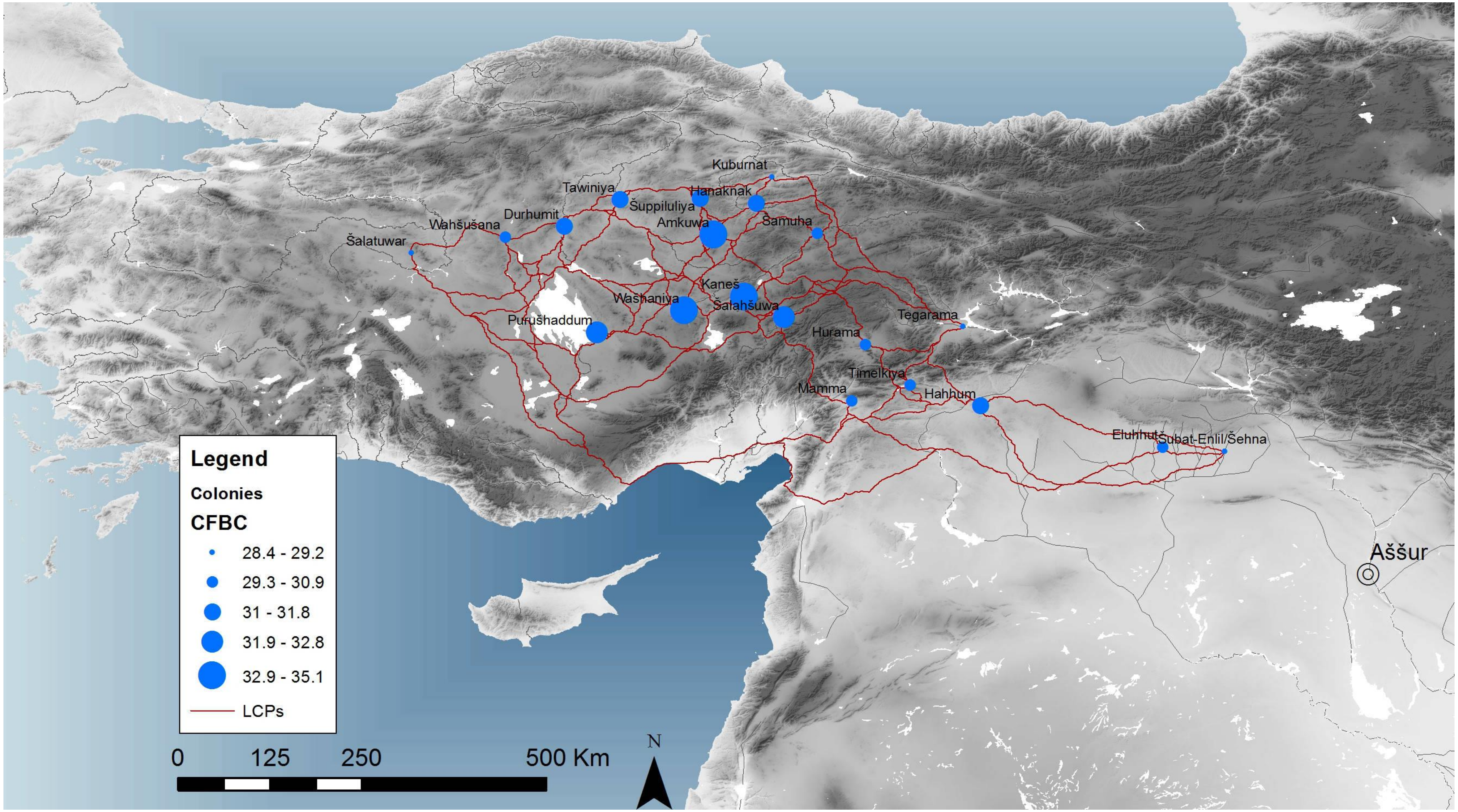

Figure 202. Current Flow Beetweenness Centrality (CFBC) of Old Assyrian commercial settlements. Forlanini's model for Kültepe's lower town level Ib period (ca. 1835-17th c. BC).

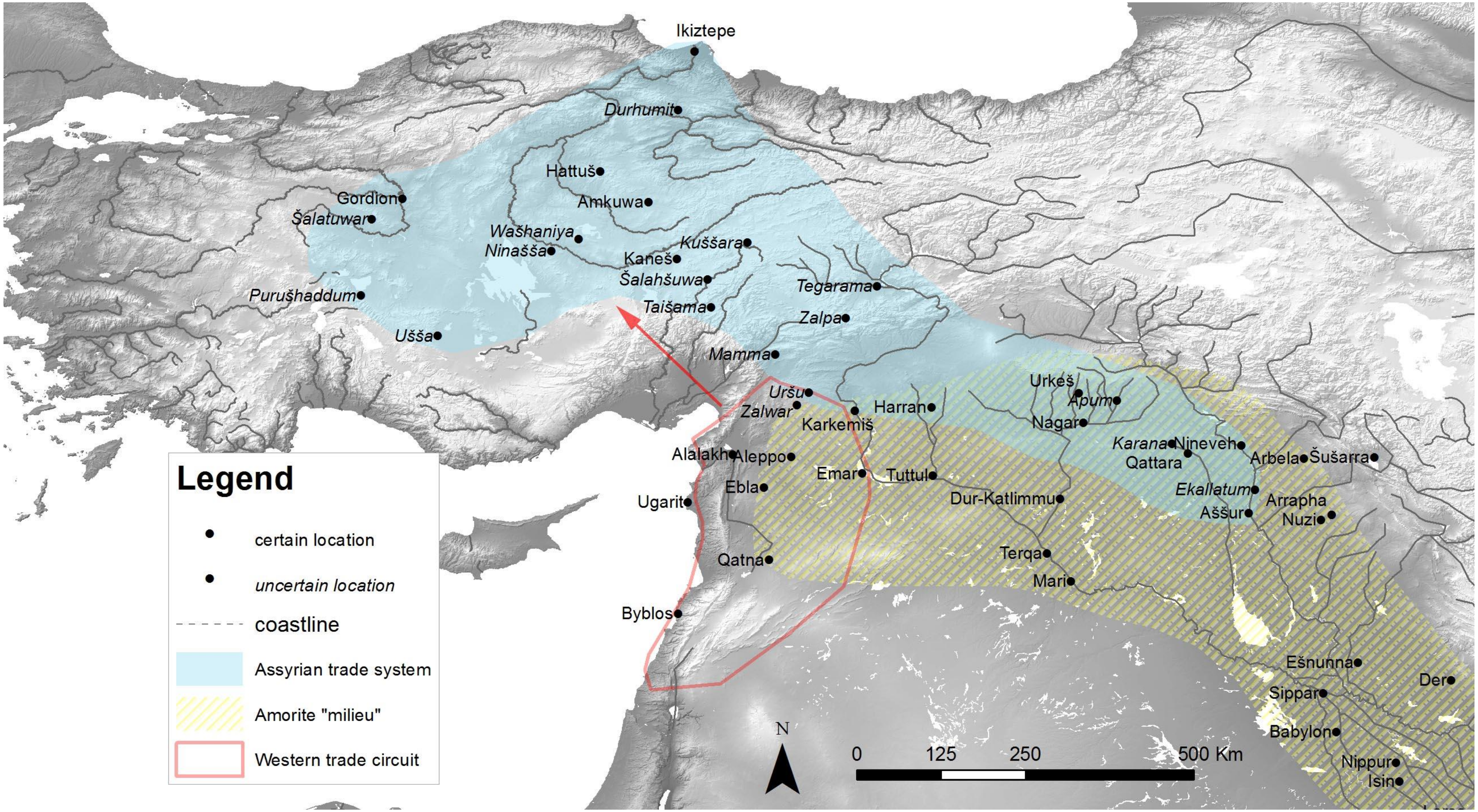

Figure 203. Areas of interaction in Upper Mesopotamia and Anatolia in the early second millennium BC.